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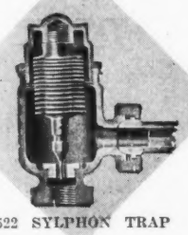
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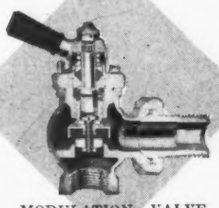
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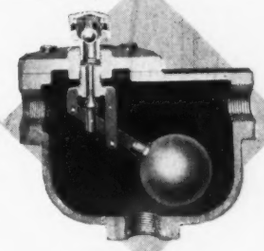
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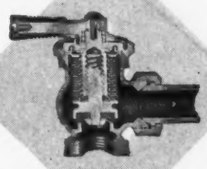
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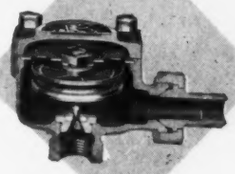
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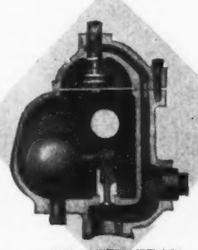
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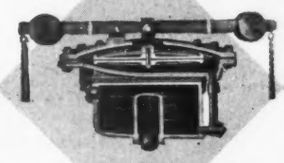
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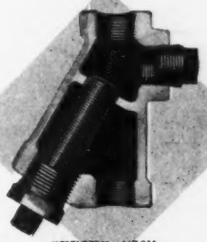
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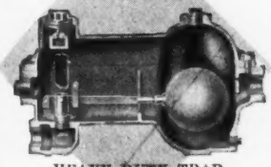
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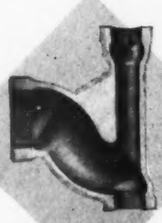
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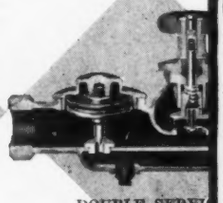
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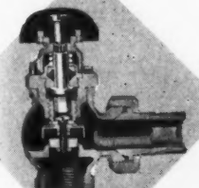
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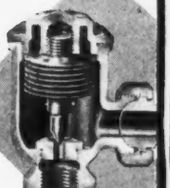
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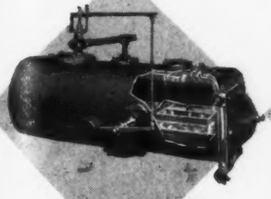
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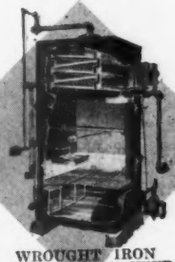
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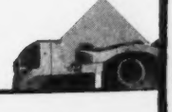

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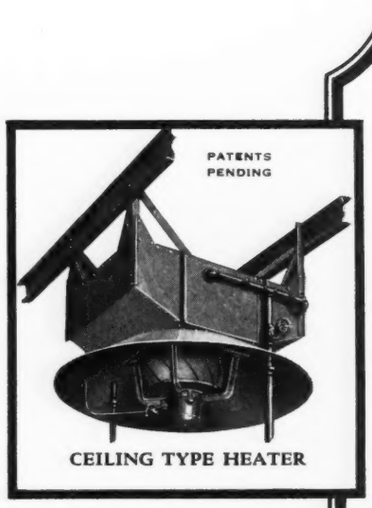

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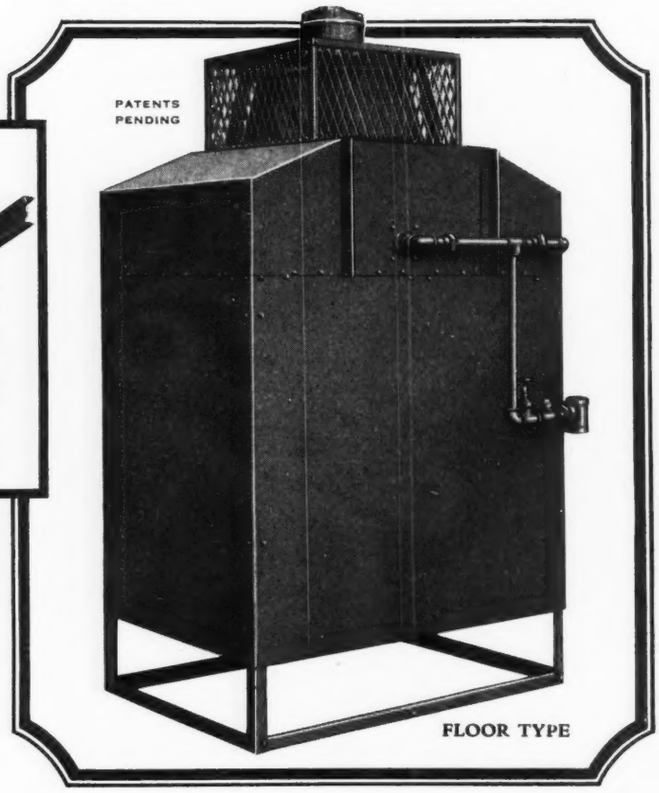

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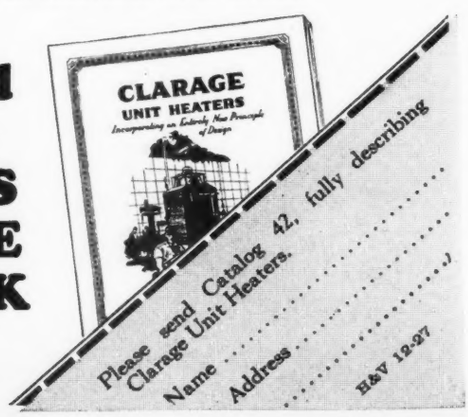

The Heating and Ventilating Magazine

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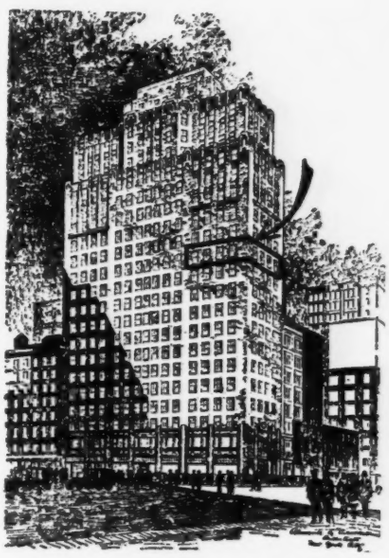

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The Progress of Heating and the Prevention of Heat Waste

Tenth of a Series

Time's Changes

Time indeed changes the nature of man.

In the early days of his existence and up through the ages of the ancients and pioneers, man's problem was the keeping of his fire, and keeping warm.

Today heat flows so freely and abundantly that no thought is given it; it is carelessly unattended.

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The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

DECEMBER, 1927

New Data on Window Leakage in Skyscrapers

Studies on Metal Windows in a Modern Office Building Reveal Effectiveness of Weatherstripping in Reducing Heat Losses

SOME first-class practical data on air infiltration around metal windows in a modern office building and the effect of weatherstripping in reducing this leakage are reported in a paper to be presented by Director F. C. Houghten and M. E. O'Connell, of the Research Laboratory at the annual meeting of the American Society of Heating and Ventilating Engineers, in New York, in January. The building selected for the test was that of the Southwestern Bell Telephone Company, in St. Louis, the architects being Mauran, Russell, and Crowell, and the associate architect, I. R. Timlin.

THE study here described was made possible by co-operation between the A. S. H. & V. E. Research Laboratory and other organizations, including four of the leading manufacturers of window metal weatherstrips, namely, Athey Company, Campbell Metal Window Corporation, Chamberlin Metal Weatherstrip Company, and Monarch Metal Products Company.

Each manufacturer of weatherstripping equipped one window and furnished other equipment necessary for the tests. The tests themselves, however, were made by the staff of the Research Laboratory during May and June, 1927, under the general direction of Samuel R. Lewis, chairman of the society's Committee on Research. The principal portions of the report follow:

The Southwestern Bell Telephone Building, in St. Louis, Fig. 1, is a modern skyscraper of the setback type, partly occupied by the telephone company for its exchange and office requirements. The other space in the building is leased for office purposes. The building is 32 stories high and contains 514,380 sq. ft. of floor space.

Windows having a northern exposure in the northwest corner of the eleventh floor were chosen for test. These windows may be seen by referring to Fig. 1, while Fig. 2 shows a plan of the eleventh floor. Windows 1, 2, 3, 4, and 5 were tested. Window 6 was used for collecting wind pressure data and for other observations.

PROBABLE VALUE OF RESULTS OF STUDY

The investigation, for reasons, was of particular interest to engineers, architects, and building owners.

1. It gave an opportunity to study infiltration through metal windows, on which little or no data have been available.

2. It offered information on the average effect of various types of leakage-retarding devices in reducing infiltration through such windows.

3. It offered an opportunity to demonstrate the feasibility of making infiltration tests on windows in an actual building.

4. It was hoped that the findings would give an indication of the reliability of results on air leakage through windows collected under laboratory conditions where an artificial wind pressure is created by fans.

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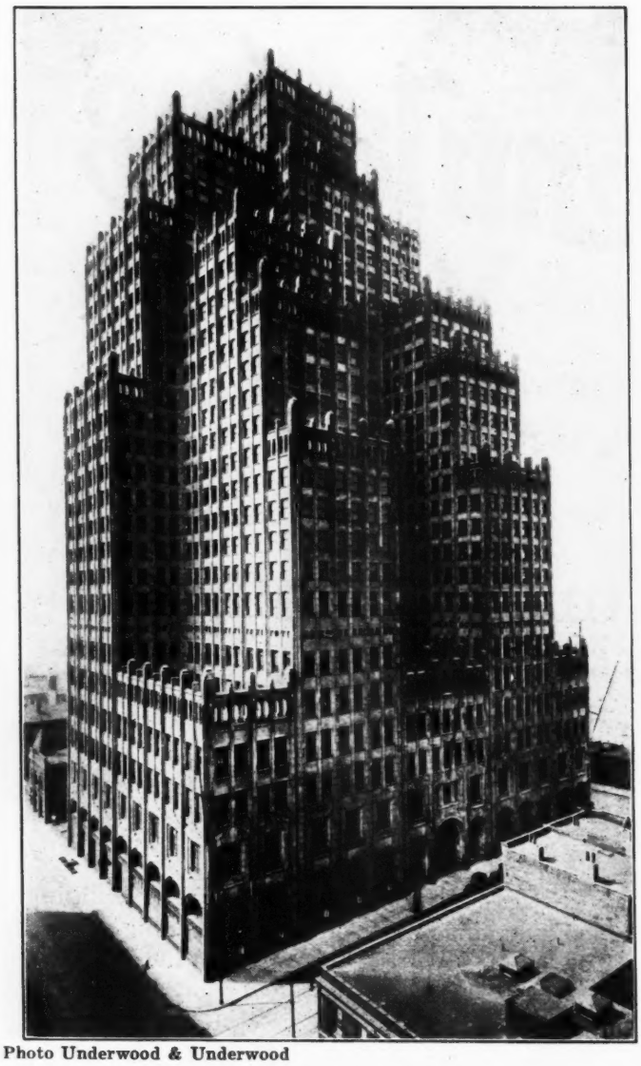

Photo Underwood & Underwood

Fig. 1. New Southwestern Bell Telephone Building, St. Louis, Mo.

APPARATUS USED

Because of difficulties with the orifice method of testing leakage around windows, the method shown in Fig. 3 was finally adopted and used throughout the tests. The collecting hood *A* was clamped to the wall around the window under test. Air was exhausted from the collecting chamber by means of the blower *B* through the gas meter *C* so as to maintain zero pressure difference between the collecting chamber *A* and the room *D*. This insured the same leakage through the window at any wind velocity as would take place if the collecting chamber was not clamped to it. In other words, it insured normal leakage through the window.

A calibrated gas meter was used for measuring the air taken from the collecting chamber. The exhaust fan used had a capacity in excess of the estimated requirement for exhausting all of the infiltering air through the meter. Valves *E*, *F*, and *G* made it possible to control the flow so as to maintain a constant pressure in the collecting chamber equal to that in the surrounding room, as indicated by a sensitive inclined pressure gauge *H*. Meters having a capacity of 5,000 cu. ft. per hour were used for testing the weatherstripped windows. A 10,000 cu. ft. meter was used for testing the non-weatherstripped window. Standard 4-in. pipe was used for the duct between the collecting chamber and meter, and 3-in. pipe between the meter and blower. A 3-in. gate valve was used for main control, and 2-in. valves for by-pass control.

All five meters were connected in series with one of the exhaust blowers, and air was drawn through them at various rates. After taking into consideration the difference in pressure of the air passing through the different meters due to the pressure drop through the series, and after applying the calibration correction to each, all meters read alike at all rates of flow to within plus or minus 1%.

Fig. 4 shows the collecting chambers, meters, and other test equipment attached to the five windows under test. The windows were all of the same size and construction. The choice of windows for the different leakage-retarding devices was decided by lot. From the reader's right to left, they are in the following order—the *Athey* stripped window, the non-weatherstripped window, the *Chamberlin* stripped window, the *Campbell* improved window, and the *Monarch* stripped window.

CONSTRUCTION OF WINDOWS

The windows as found in the building were Campbell metal frame and a sash of that firm's standard specification of 1925. The unstripped window was tested without any adjustment or change from the condition in which it was found. Before the windows which were to be weatherstripped were altered, the force necessary to open each of the five windows was determined. A spring balance was attached by cords to the two hand grips on the sash and force of increasing magnitude was applied until the sash began to move. The force was then reduced so that the sash continued to move with uniform velocity. The force necessary to start the sash and that necessary to continue it in uniform motion after starting were both recorded. The forces necessary to start and open the windows after the application of the weatherstripping were also determined. The averages of the forces necessary to start the six sash

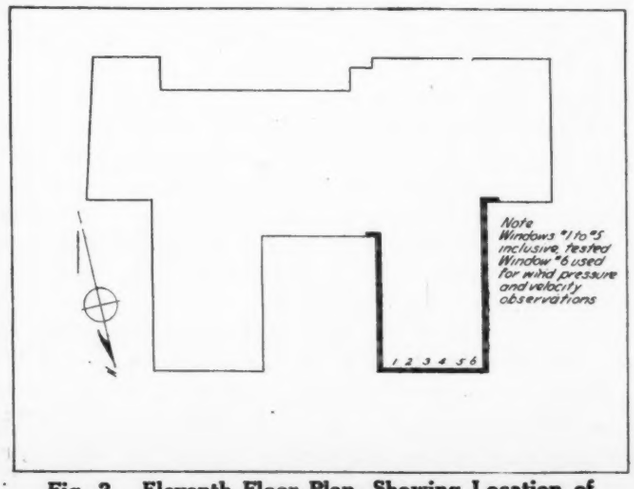

Fig. 2. Eleventh Floor Plan, Showing Location of Windows Tested

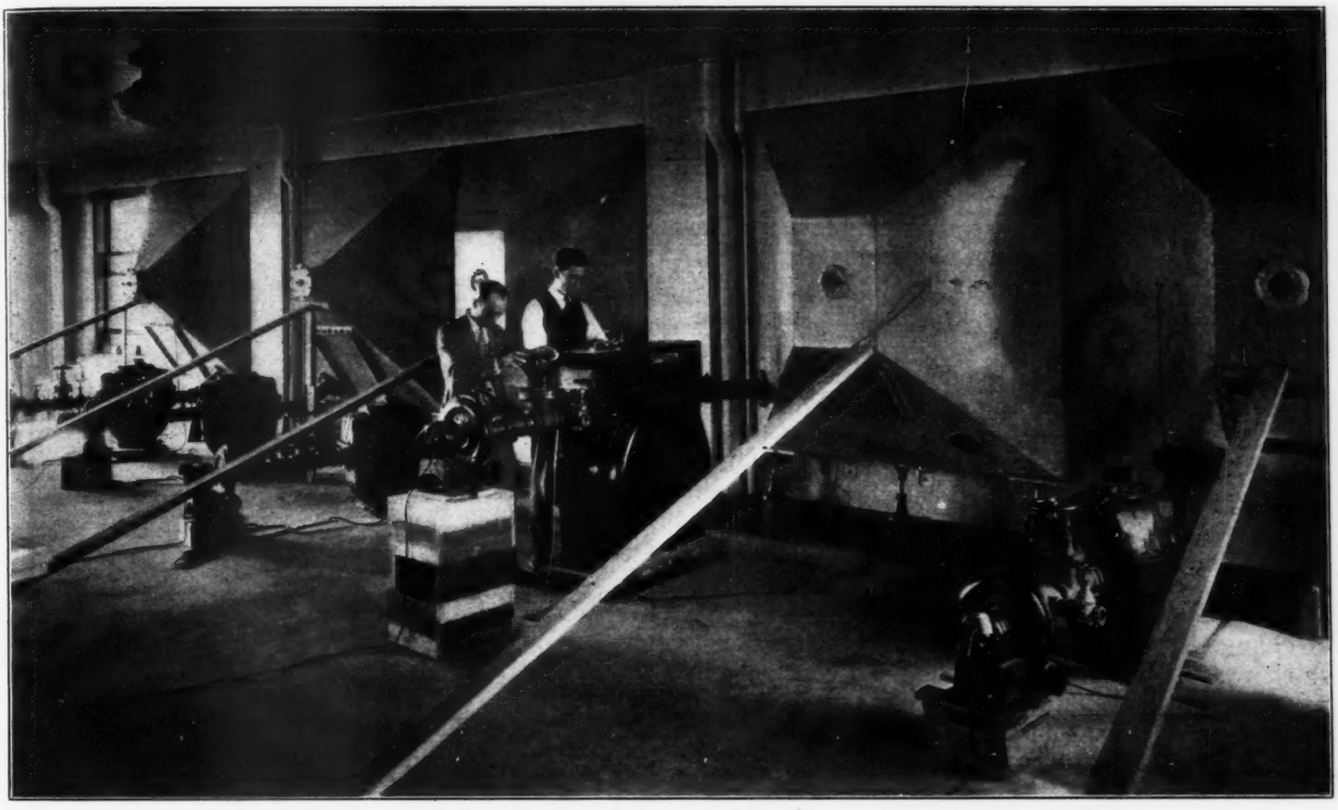

Fig. 4. Set-Up for Testing Window Leakage in Southwestern Bell Telephone Building

before and after weatherstripping were 29 lbs. and 5 lbs., respectively. After the sash were started, average forces of 14 lbs. and 20 lbs., respectively, were necessary to continue their uniform motion.

It was hoped that data could be obtained on the decrease in leakage resulting from caulking around the frame. Therefore, it was planned to make tests first without caulking the frames and again after the crack between the masonry and the frame was caulked. The windows tested, however, were so well caulked that a careful inspection did not reveal a single hair crack between the frame and masonry. It was not necessary, therefore, to caulk the frames.

To make certain that no leakage took place between the glass and the sash, all such joints were sealed where it seemed the least bit possible that leakage could take place.

Fig. 5 shows the frame and sash as found in the building. Figs. 6 to 9 show details of the application of the different leakage-retarding devices. The Campbell improved window was changed by that firm in accordance with the present specification of its standard equipment, which includes a leakage-retarding feature built into the window. Each of the other windows was equipped with weatherstripping by representatives of the respective companies participating in the studies. The test equipment was then installed and made ready for operation with the exception of closing the man-hole opening *I*, Fig. 3. Representatives of the different improved windows were then allowed to inspect finally their respective windows, immediately after which the windows were inspected by a committee of three, representing the architects, the Bell Telephone Company, and the Research Laboratory. After inspection both the upper and lower sash of each window were run up

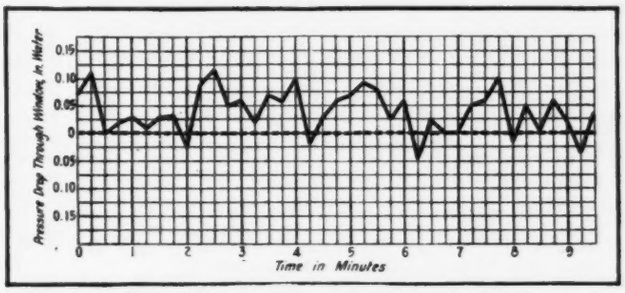

Fig. 3a. Fluctuation in Pressure Through Window with a 12 to 15-Mile Wind

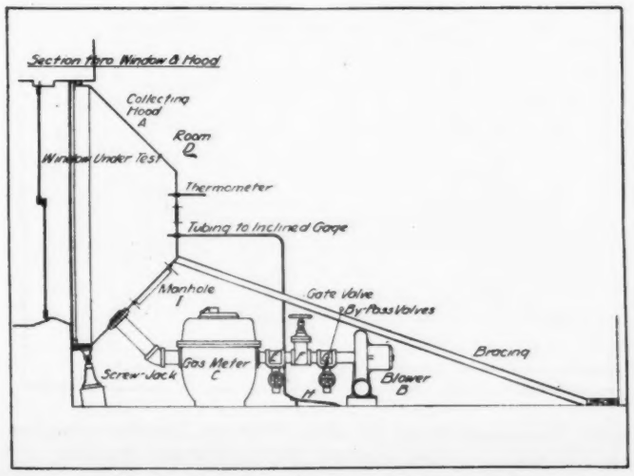

Fig. 3. Method Used in the St. Louis Air Leakage Tests

and down several times, closed tightly, and locked. As soon as this was accomplished, the man-holes were closed, and sealed.

The sixth window left, Fig. 2, was fitted with a tube leading outside, flush with the window surface, and connected by rubber tubing to an inclined pressure gauge for observing wind pressure against the window. The corner window at the reader's left, Fig. 2, having a western exposure, was likewise fitted with a tube leading to the outside, so that the wind pressure on this exposure could be observed.

A Tycos electric cup anemometer was placed on top of a pent-house on the roof of the Majestic Hotel, across the street from the windows under test. At that point, the anemometer was about 100 ft. in front of, and about 20 ft. below, the windows tested, and clear of all obstructions for about a block on all sides, with the exception of the Bell Telephone Building. The anemometer was of the electrical contact indicator type. Observation of the change in reading of the indicating instrument, which was in the test room, over a given period, gave the wind travel, and the average wind velocity could be calculated. The St. Louis station of the U. S. Weather Bureau is four blocks east and one block north of the Southwestern Bell Telephone Building, and meteorological readings for any period were available.

TEST MANIPULATION

In making a test, an observer manipulated the valves so as to maintain a zero pressure drop between the collecting chamber and the room, as indicated by the sensitive pressure gauge before him. An observer was required for such manipulation for each window under test. If sufficient observers were not available for making simultaneous tests on all windows, tests were made on at least two windows, one of which was always the non-stripped window. Another observer made frequent observations of the anemometer indicator, pressure gauges, meters, and wind direction. The wet- and dry-bulb temperatures also were recorded. The wind direction and velocity and barometric reading later were obtained from the weather bureau for the period of the test.

It was hoped to obtain tests with wind velocities perpendicular to the window ranging up to 30 miles an hour, but it was soon found, however, that satisfactory wind was not to be had excepting at very infrequent intervals, and then the velocity was never very high.

A large number of tests were made with pressure drops through the window created by exhausting air from the collector chambers. Pressure drops equivalent to various wind velocities could easily be maintained for such tests. One observer controlled the pressure drop through each window under test by manipulating the valves while another observer recorded other observations. A few tests also were made by reversing the process—that is, by blowing air into the collecting chamber through the meter so as to give a desired positive

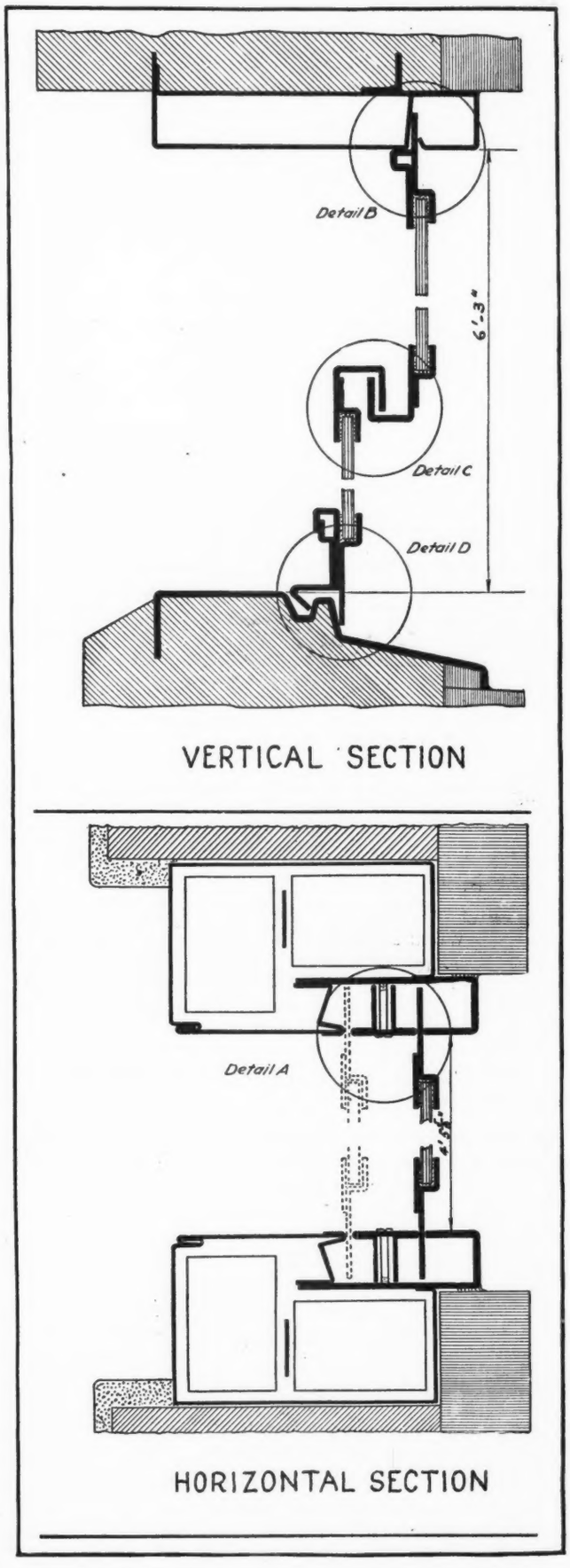

Fig. 5. Campbell Metal Window Without Weatherstripping as Installed in Southwestern Bell Telephone Building

pressure in the collecting chamber and a pressure drop through the window.

After an extended series of tests with the locked windows had been made, the seal on the man-hole covers in the collecting chambers was broken, and the covers were removed. The windows were unlocked, opened, and closed several times, and then closed tightly, after which the man-holes were again closed and sealed. A short series of tests was then made on the unlocked windows, with artificial wind pressures only, that is, by maintaining a pressure drop through the window by exhausting air from or blowing air into the collecting chamber.

Points on curves *C* and *D*, respectively, Fig. 10, are the result of tests with artificial wind pressures on the non-weatherstripped window, locked and unlocked.

(Additional charts in the Research Laboratory's report showed how closely the test points for natural wind pressures against locked, non-weatherstripped windows checked with the pressure drop resulting from natural winds as observed at another window.)

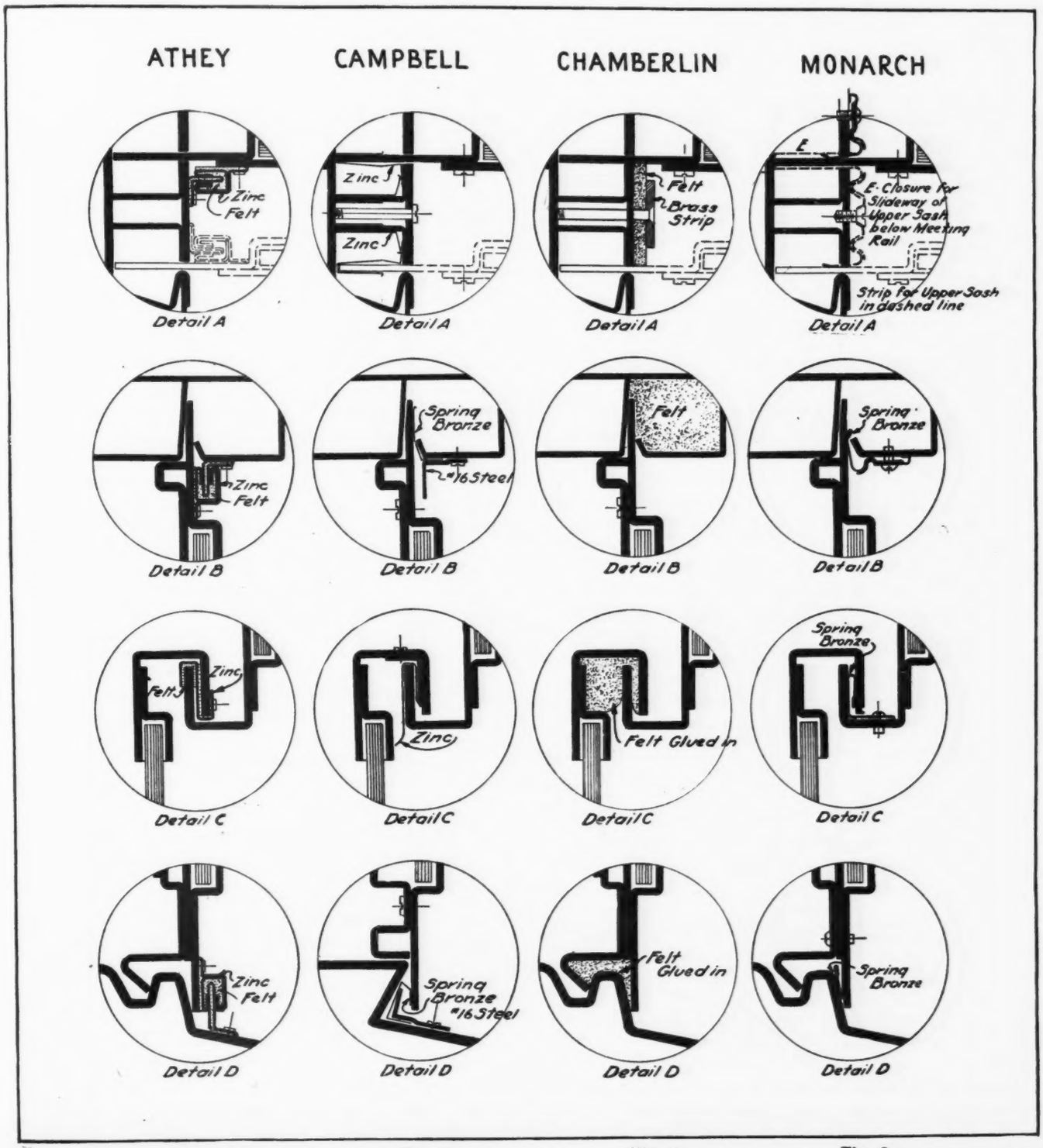

Fig. 6 Fig. 7 Fig. 8 Fig. 9

Figs. 6 to 9. Details of Application of Different Leakage-Retarding Devices, Southwestern Bell Telephone Building

TABLE 1. INFILTRATION THROUGH METAL WINDOWS

Wind Velocity Miles per hr.	Non-weatherstripped Window, Locked			Non-weatherstripped Window, Unlocked			Weatherstripped Window, Unlocked		
	Leakage cu. ft./-hr.	Heat Loss B.t.u./hr. 0-70° F.	Sq. Ft. Radiation	Leakage cu. ft./-hr.	Heat Loss B.t.u./hr. 0-70° F.	Sq. Ft. Radiation	Leakage cu. ft./-hr.	Heat Loss B.t.u./hr. 0-70° F.	Sq. Ft. Radiation
5	660	832	3.5	660	832	3.5	210	265	1.1
10	1470	1852	7.7	1530	1928	8.0	600	756	3.2
15	2280	2872	12.0	2400	3025	12.6	1020	1285	5.4
20	3120	3932	16.4	3360	4235	17.7	1488	1875	7.8
25	4050	5105	21.3	4440	5595	23.3	1950	2458	10.2
30	4980	6275	26.2	5520	6960	29.0	2460	3100	12.9
35	6060	7640	31.8	6870	8660	36.1	3060	3858	16.1

TABLE 2. INFILTRATION THROUGH METAL WINDOWS PER FOOT OF CRACK

Wind Velocity Miles/-hr.	Non-weatherstripped Window, Locked			Non-weatherstripped Window, Unlocked			Weatherstripped Window, Unlocked		
	Leakage cu. ft./-hr.	Heat Loss B.t.u./hr. 0-70° F.	Sq. Ft. Radiation	Leakage cu. ft./-hr.	Heat Loss B.t.u./hr. 0-70° F.	Sq. Ft. Radiation	Leakage cu. ft./-hr.	Heat Loss B.t.u./hr. 0-70° F.	Sq. Ft. Radiation
5	25.5	32.1	0.13	25.5	32.1	0.13	8.1	10.2	0.04
10	56.8	71.5	0.30	59.1	74.4	0.31	23.2	29.2	0.12
15	88.0	110.8	0.46	92.5	116.8	0.49	39.4	49.6	0.21
20	120.4	151.8	0.63	129.7	163.4	0.68	57.5	72.4	0.30
25	156.3	197.0	0.82	171.4	216.0	0.90	75.3	94.9	0.40
30	192.2	242.2	1.01	213.0	268.7	1.12	95.0	119.9	0.50
35	233.8	294.9	1.23	265.0	334.3	1.39	118.1	148.8	0.62

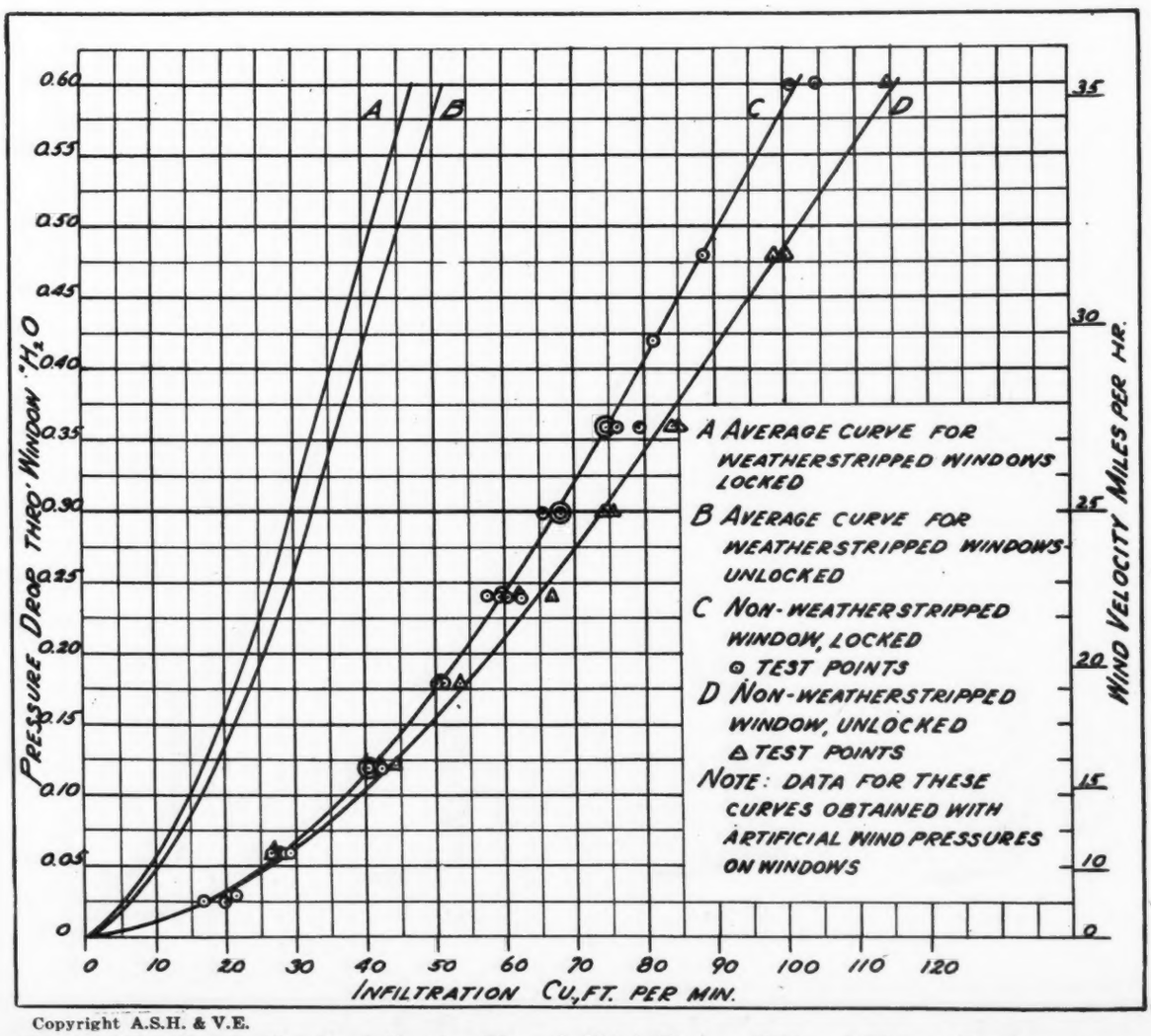

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Fig. 10. Test Results Showing Infiltration Through Metal Windows With and Without Weatherstripping

Curves *A* and *B*, Fig. 10, are the averages of curves for all four weatherstripped windows for the locked and unlocked conditions, respectively.

DISCUSSION OF RESULTS

The data in Fig. 10 and Tables 1 and 2, indicate that consistent results can be obtained from tests on windows in an actual building. The data collected when artificial wind pressures are produced show a very consistent curve, even though tests were made under varying conditions and over a period of several weeks. In this connection it was found that for natural wind pressures practically the same leakage results from a given pressure drop regardless of whether it is produced artificially or by a natural wind. Curves *A* and *B*, Fig. 10, the averages of all weatherstripped windows tested, show that the average of the leakage-retarding devices decreased the leakage about 56% for a 30-mile wind.

It should be added that the maximum variation of any strip from the averages as given in curves *A* and *B*, Fig. 10, is little greater than might be expected by the application of the same strip to two different windows by different mechanics. The variation in leakage through the different stripped windows tested is of minor importance when compared to the great reduction in leakage resulting from the application of any of the strips tested.

Curves *C* and *D*, Fig. 10 show the reduction in leakage resulting from locked windows. This fact is of some importance in the conservation of heat, and is a factor worthy of consideration in meeting the heating requirements of a large building in severe weather. The heat loss by infiltration through windows of the type tested is reduced about 10% by locking, with a 30-mile wind.

CONCLUSIONS

1. The investigation establishes the heat loss by infiltration through the metal windows tested for different conditions as given in Tables 1 and 2. It indicated that infiltration loss through such metal windows can be reduced about 10% by locking an unweatherstripped window, and an average additional 56% by applying weatherstripping of the types studied to the locked window.

2. Application of leakage-retarding devices to metal windows of the type studied can be accompanied by an average reduction in radiation installed to meet the heating requirements in zero weather with a 15-mile wind, of 0.28 sq. ft. per foot of crack around the sash or a reduction of 7.2 sq. ft. per window of the particular size investigated.

3. Determination of infiltration through windows in actual buildings is quite feasible although much more difficult than making similar tests under laboratory conditions.

4. Data collected under natural wind pressures in an actual building are practically the same as those collected for artificial wind pressures. It may be assumed, therefore, that data collected under laboratory conditions with artificial wind pressures are quite satisfactory.

What Is Static Pressure?

By Dr. George De Bothezat

President, De Bothezat Impeller Company

THE best way fully to understand what static pressure is, is to draw a parallel between the electric generator—which generates electric current—and the fan, which is essentially a generator of air current. When we have to send the electric current furnished by an electric generator into a circuit having a high resistance, the electric generator must be able to develop a voltage high enough to overcome the electric resistance of the electric circuit.

Static pressure is for a fan exactly what voltage is for an electric generator. That is, static pressure (S. P.) is the tension factor for the air current in the same way as voltage is the tension factor for the electric current; the volume of air delivered by the fan per unit of time (C.F.M.) being exactly the equivalent of amperage furnished by the electric generator.

When a fan has to secure the circulation of air through a certain air circuit, it must be able to develop the necessary static pressure to overcome the different resistances in its path. For air currents, these resistances appear in the shape of friction against the walls of air ducts, changes of direction of the air current (bends in ducts), variation of the section available for the air flow, vortices and eddy currents created by different obstacles to the air flow, etc.

To speak about a fan without any reference to its static pressure is thus a physical anomaly. One can form a judgment about a fan (generator of air current) only if both its characteristic factors —the C.F.M. and the S.P. are specified.

BY WHAT PHYSICAL STATE IS STATIC PRESSURE EXPRESSED IN THE PHENOMENA OF OPERATION OF A FAN?

When a fan furnishes static pressure, it not only communicates a certain velocity to the air but it also compresses the air. The density of the air delivered by a fan furnishing static pressure actually is higher behind the fan—defined in relation to the sense of the air flow—as compared to the density in front of it. In other words, the air, when passing through a fan furnishing static pressure, has its density somewhat increased.

The air delivered by a fan furnishing static pressure continues to move forward after having passed the fan, not only on account of the velocity acquired, but also by expansion. This is the case when the fan is forcing air from the free atmosphere into a certain system. That is why such air currents can well pass through bends, where most of the air velocity is lost, because it continues to move by expansion after passing same. In a case where the fan is exhausting air, the phenomena are reversed. The air is set in motion

by the depression created in front of the fan and the air pressure is again brought up to the normal level of the free atmosphere after passing through the fan.

HOW IS AIR COMPRESSION EFFECTED BY A FAN?

When we have air in a cylinder and compress it by a piston—say, in a bicycle pump—this compression is attained statically, viz., by a direct push on the air by the piston. But a fan compresses the air dynamically, that is, by impact of the blades against the air. The blades in rapid rotation hit the air and not only set it in motion but also compress it. And if the fan is so built that one blade follows the other quickly enough so that the air compressed dynamically by one blade has not the time to leak backwards in the space between the blades, the air will stay compressed.

One readily can understand that such dynamical air compression is a very subtle phenomenon, and a profound knowledge of laws of air resistance is necessary to accomplish it successfully and with high efficiency. But one easily can see that it is quite impossible to attain such air compression by a fan not having a sufficient number of blades. In such cases, the intervals between the blades are out of proportion to the blades themselves and most of the air slightly compressed by the motion of each blade leaks backward in the spaces between the blades.

Why should the air stay compressed in front of the large open spaces available for its expansion between the blades? One can rather marvel that even with a large number of blades it is possible to keep the air compressed despite the open intervals between them.

DISTINCTION BETWEEN AIR PROPELLER AND FAN

An air propeller is in no sense a fan. Exactly speaking, it is something just opposite to a fan. A propeller is designed for the purpose of furnishing a powerful thrust with high efficiency. The ventilation phenomenon connected with the operation of a propeller constitutes a loss. Learned propeller designers call it the slip velocity loss. And certainly, in any kind of apparatus, in order to get a high efficiency, one must reduce the losses.

Thus a highly-efficient propeller must be a low-efficiency fan, otherwise it could not be a high-efficiency propeller. But what is a loss for a propeller constitutes precisely the useful action for a fan. A fan must be so designed to produce a large flow of air, because that is just the factor we want to utilize, with complete disregard to the axial thrust furnished by a fan which, in the case of a fan, is only harmful because of the wearing out of the bearings produced by it.

Thus, a good fan must be a bad propeller. The fact that standing in the slip stream produced by an air propeller feels like a very strong air current does not mean anything, because we must compare the power of the air current to the power of the engine producing it. Aeroplane engines are very powerful engines—200 H.P., 500 H.P., etc.—and thus it is not surprising that although propellers are fans of very low efficiency, they still produce powerful air currents, but they produce them very wastefully.

The same slip stream created by a propeller could be produced by a high efficiency fan with much less power, but such a fan would be a poor propeller for the propulsion of the aeroplane. And no one should be surprised at such state of affairs.

In order to complete our analogy between the generator of air flow, viz., the fan, and the generator of electric current, the following further remarks are necessary.

DISTINCTION BETWEEN ELECTRIC GENERATOR AND AIR FLOW GENERATOR

A fan can usually be short-circuited without any harm. This happens under the so-called free delivery conditions of operation. But attention must be drawn to the fact that what appears to be free delivery condition often proves on closer analysis not to be so in reality. Thus, when the fan is exhausting air through a window in a room, this is not free delivery, because we must consider how the air exhausted through the window gets into the room. If the doors and other windows of the room are closed, or even the air inlet—whatever it is—is not located right in front of the fan, but at right angle, for example—then quite a resistance may have to be overcome to draw the air into the room. The simple exhaust of air through a window thus is usually already a resistance job, and a fan that is not able to develop the necessary static pressure will give only a delusive performance. The closest to the free delivery condition is reached by a fan operating in the middle of a large room, simply circulating the air around itself.

Thus, a fan is similar to an electric generator with a high interior resistance. The dynamos and alternators are electric generators with a small interior resistance and cannot be short-circuited. But a dry battery has a high interior resistance and resembles more closely the generator of air flow in that respect.

DISTINCTION BETWEEN ELECTRIC CIRCUIT AND AN AIR CIRCUIT

There is also another factor to consider. Electric resistance does not depend upon the intensity of the electric current that traverses it—so far as temperature variations can be neglected. But the resistance of air circuit does depend upon the air velocity in the circuit and, in general outlines, varies as the square of this velocity. As this air velocity is the exact counterpart of the current density in an electric circuit, we can say that the resistance of an air circuit varies as the square of the air current density in the flow section, or in other words, as the square of the air velocity in the air-circuit section. It is for this last reason that the computation of the resistance of an air circuit is much more complicated a problem than the computation of the resistance of an electric current.

Short-Circuiting in Heating Systems

Return Line Pressures, Traps to Maintain Pressure Differential and Other Practices Which Emphasize Advantages of Reversed Return

By Charles F. Wolfsfeld

Part II

SUPPOSE we re-designed the return main of this heating system* by reversing its direction of flow; what effect might we expect this to have on the circulation? This arrangement is shown in Fig. 10. It will be noted that the dry return flows *away* from the boiler, instead of *toward* the boiler, and also that the direction of flow in the steam supply main and in the dry return main are the same, instead of opposed.

HOW PRESSURES AT VARIOUS POINTS ON RETURN LINE WERE OBTAINED

In order to illustrate how the pressures in the various points on the return line were obtained, consider point "E," close to the location where the dry-return main drops and becomes wet.

Every particle of steam that finds its way to any radiator passes back through the dry return into the wet return, and, in so doing, every such particle completes a "circuit." The particles serving the radiator nearest the boiler describe the circuit A-B-I-B-C-D-E.

For the radiator farthest from the boiler this circuit becomes A-B-C-D-E-F-E. By applying this test to the remaining radiators, it will be noted that the total length of travel in each case will be 60 ft. That is, *all circuits throughout the system are of equivalent length or resistance.*

The total pressure-loss from the boiler to point "E", therefore, is $(60 \div 10) \times 0.1$, or 0.6 lbs. This causes the pressure at point "E" to be 15.7 — 0.6, or 15.1 lbs., as shown. The pressures at other points were derived in the same manner. The question may be asked "Why is not the wet return included in estimating the total resistance of any circuit?" This line always is entirely filled with water moving at such a low velocity that its resistance is negligible.

*See Part I, November issue.

An examination of pressure conditions at the radiators reveals a highly desirable feature—*absolute equality.* The piping system has been equalized so as not to favor one radiator and put another at a corresponding disadvantage.

In the original piping layout, Fig. 6, the circuit for the radiator nearest the boiler is A-B-I-B-A, a total length of travel of 40 ft., whereas the circuit for the radiator farthest from the boiler is A-B-C-D-E-F-E-D-C-B-A, a total length of travel of 100 ft., or *two and one-half times that of the circuit for the radiator near the boiler.* This is the reason for the great difference in pressures at the supply and return tappings at the radiator near the boiler and the decreasing differences for radiators farther from the boiler.

CIRCULATION IN THE FARTHEST RADIATOR

A point in connection with the radiator farthest from the boiler merits reflection. Since there is no difference in pressures between the steam and return connections for any radiator of the reversed-flow system (Fig. 10), why won't the farthest radiator of the direct-flow system (Fig. 6) circulate properly, the pressure conditions being identical?

In the piping layout shown in Fig. 6, the pressure conditions, of course, are hypothetical, the pressures being indicated at the various radiator connections to show the unbalancing effect of short circuits, such as that of the first radiator.

USE OF TRAPS TO MAINTAIN PRESSURE DIFFERENTIAL

It is possible to have a pressure of 15.5 lbs. at the steam connection to a radiator and 14.7 lbs. at the return connection. In order to maintain this condition, however, some kind of trap or specialty must be placed in the return connection so that the

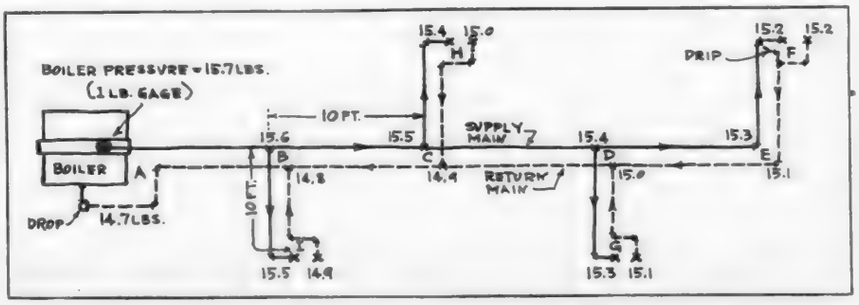


Fig. 6. A Simple Two-Pipe Gravity Steam Heating System

The differences in pressure between supply and return are greatest near the boiler and zero at the end of the main. The direction of flow in the supply is opposite to that in the return.

(Original layout from which the arrangement shown in Fig. 10 was evolved. Reproduced for convenience in reference from Part I, November issue).

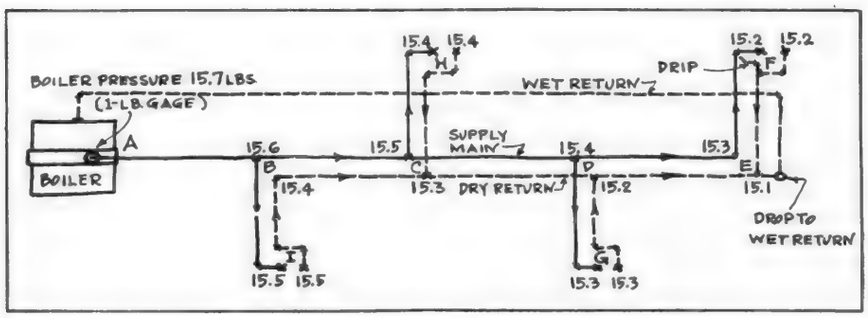


Fig. 10. Heating System Shown in Fig. 6 With Reversed Return

Note that the direction of flow in steam and dry return is the same. Also that the pressure at steam and return connections is the same for any radiator. Traps placed across any point in the steam and dry return mains would operate on the same pressure differential, namely 0.2 lbs.

"pressure differential" may be utilized for forcing the water and air into the return line without passing steam. And, for the system illustrated, this trap or other contrivance would have to be suitable for a decreasing differential as the radiators recede from the boiler.

This constitutes a "differential system" for every radiator except the last radiator off the main, which radiator would operate purely on a gravity basis. For the reversed-return-flow system, on the other hand, each and every radiator operates on gravity (Fig. 10).

Without such devices, the tendency of the higher pressure in the steam supply is to pass this steam through the radiator into the return line, resulting in a higher pressure in the return than indicated in Fig. 6. That would have the effect of holding back the condensation and retarding its flow from the other radiators, the last radiator suffering the most because it has no differential-head for resisting the counterflow.

A piping system, such as that shown in Fig. 6, could be equalized by introducing resistances, such as valves, orifices, small pipe sizes, etc., in the various lines so as to make the total resistance to and from each radiator the same. And after everything is said and done, it is a question whether the circulation would be as good as with the return reversed.

PROBLEM OF SHORT-CIRCUITING IN DIRECT-FLOW RETURN SYSTEM USING VACUUM PUMPS

In systems where a differential pressure at the radiators is maintained by the use of vacuum return pumps, the direct-flow return system, with its short-circuiting action, is much more serious. Fig. 11 shows a typical vacuum return heating system. Steam leaves the boiler at atmospheric pressure, slightly higher or lower (13.7 lbs. to 15.7 lbs.), and flows through the main serving the various riser and radiator connections. The returns from the system flow back in the opposite direction to that of the steam supply, the return main continuing, after collecting the returns and drips near the boiler, to the vacuum pumps, whence they are pumped back into the boiler against boiler pressure. For average conditions the pressure maintained in the return connection to the pumps is 11.2 lbs. to 12.7 lbs. (7 in. to 4 in. vacuum).

To strike an average of these practical limitations, the working pressures of 14.7 lbs. and 11.9 lbs. will be assumed for the boiler header and pump return, respectively. The total length of run of main from the boiler header to the farthest radiator is 500 ft. The distance from the main to the last radiator on each riser is 100 ft., and the distance between branch connections on the main is 20 ft., all distances including resistances expressed in terms of length of pipe. This makes the total run of main 500—100, or 400 ft. The system is designed for a total resistance or pressure-drop of 1 lb. in 500 ft., or 0.2 lbs. per 100 ft. This gives a pressure of $14.7 - [(400 \div 500) \times 1]$ or 13.9 lbs. at the end of the supply main.

The vacuum return pump, the "lungs" of the system, distends its muscles of steel to make more room for the water vapor and air entrained in the return line, by removing the volume equal to a piston displacement at each stroke. Instead of reciprocating pumps, the centrifugal type frequently is employed, but the same effect is produced. The returns, therefore, expand into a fluid at reduced pressure. The return main, having been designed for a pressure-drop or resistance of 0.2 lbs. per 100 ft., there will be a pressure-loss of 0.04 lbs. for every 20-ft. interval, the distance between return branches to the main. Does that mean that the pressure in the pump's return line will drop below that created at the pump? Will it be 0.04 lbs. less than the pump pressure of 11.9 lbs., at the first branch, 20 ft. from the pump?

Unlike the boiler which creates a *positive pressure*, the return pump creates a *negative pressure*. In other words, resistance in the pump return line *operates to decrease the negative pressure*, which means that the actual pressure in the return line will *rise*, 0.04 lbs. for every 20 ft. of run of main, as these points recede from the pump. It will be noted that in Fig. 11 the pressures in the return main, beginning with 11.9 lbs. at the pump, are 11.9, 11.94, 11.98, 12.02 lbs., and so on, there being an increase of 0.04 lbs. for every 20 ft. of run.

In this design, as in the usual case of direct-flow return mains, there obtains a high pressure-differential for the connections near the boiler and a low pressure-differential for the connections farther from the boiler. This difference for the first connection is 14.66 — 11.94, or 2.72 lbs., and, for the last connection, 13.9 — 12.7, or 1.2 lbs. Other things being equal for these two connections, we should expect that the rate of discharge through the radiator trap, close to the first connection, would be $\sqrt{2.72} \div 1.2$, or one and one-half times the rate of discharge for a trap near the end of the main. This appreciable variation, of course, is a highly

undesirable feature in itself. An additional disadvantage in having a high pressure-differential at any point in a vacuum return-line heating system is the factor known as "re-evaporation."

ACTION OF FLUID AS TEMPERATURE AND PRESSURE INCREASE

The liquid within a main is considered as being made up of innumerable small particles or molecules. These molecules are in a constant state of motion, the rapidity of which increases with an increase in temperature. As the temperature continues rising, a certain point is reached at which the velocity of the vibrating molecules becomes so great that the force of vibration exceeds the force of molecular attraction and external pressure. At this point, known as the "boiling point," the molecules, like so many minute meteors, leave their common center of gravitation and fly off on an endless journey until they meet some condition such as might be created by a fall in temperature or a confining wall, like the internal surface of a pipe.

When a liquid is subjected to increased pressure, a greater molecular activity is required for overcoming the force of this pressure; that is, the temperature of the liquid must be raised a certain amount before vaporization can take place. The boiling points of water for various probable pressures that may be encountered in low-pressure heating systems are given in Fig. 5.

To cite an extreme case which has occurred in practice, consider a steam pressure in the supply main of a vacuum heating system of 5 lbs. gauge (actual 19.7 lbs.). This main is dripped through a trap into the vacuum return main at a point close to the pumps, which are operating in an attempt to create 5 in. of vacuum, mercury gauge (12.2 lbs. actual). By consulting the gauge of Fig. 5, it is found that water at 5 lbs. pressure (19.7 lbs.) has a temperature of 227° F. That is, the water of condensation from the 5-lb. steam main will pass through the drip trap into the vacuum return at a temperature close to 227° F., unless special conditions cause this water to cool.

The gauge also gives 203° F. as the boiling point of water at 5 in. of vacuum. Can water at 227° exist in a pipe line at a pressure corresponding to a boiling point of 203°? For this condition the water of condensation contains 227° — 203°, or 24° of superheat, which heat has exactly the same effect as the heat provided by any fuel in a steam boiler. It serves to generate steam and continues to do so as long as a single degree of superheat exists. And if an appreciable number of traps

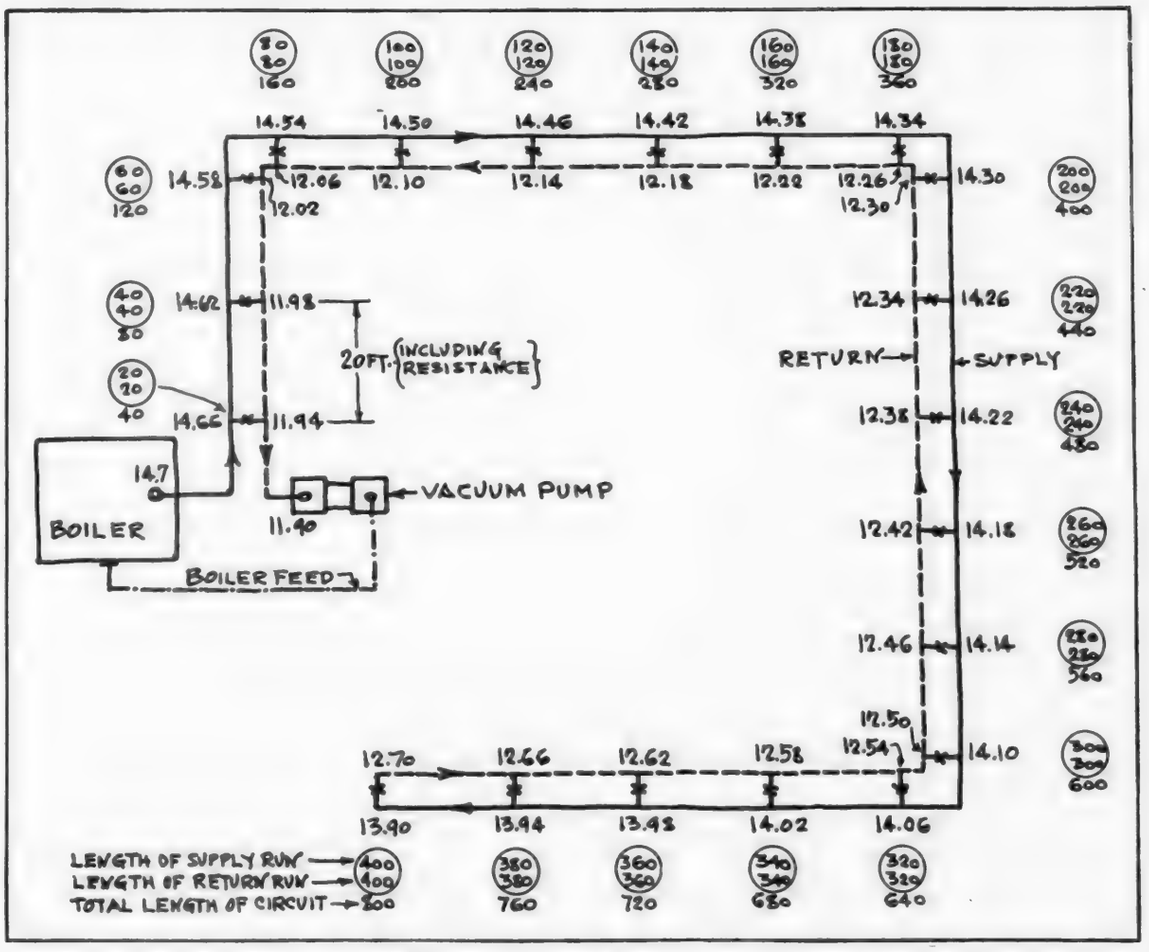


Fig. 11. A Typical Vacuum Return Heating System

The difference in supply and return pressures at the connection near the boiler is 14.66 lbs.—11.94 lbs. or 2.72 lbs., while that at the last connection is 13.90 lbs.—12.70 lbs. or 1.20 lbs. (56% less). Note also that the total length of circuit for the first connection is 40 ft., while that for the last connection is 800 ft. (20 times as great)—a highly unbalanced condition.

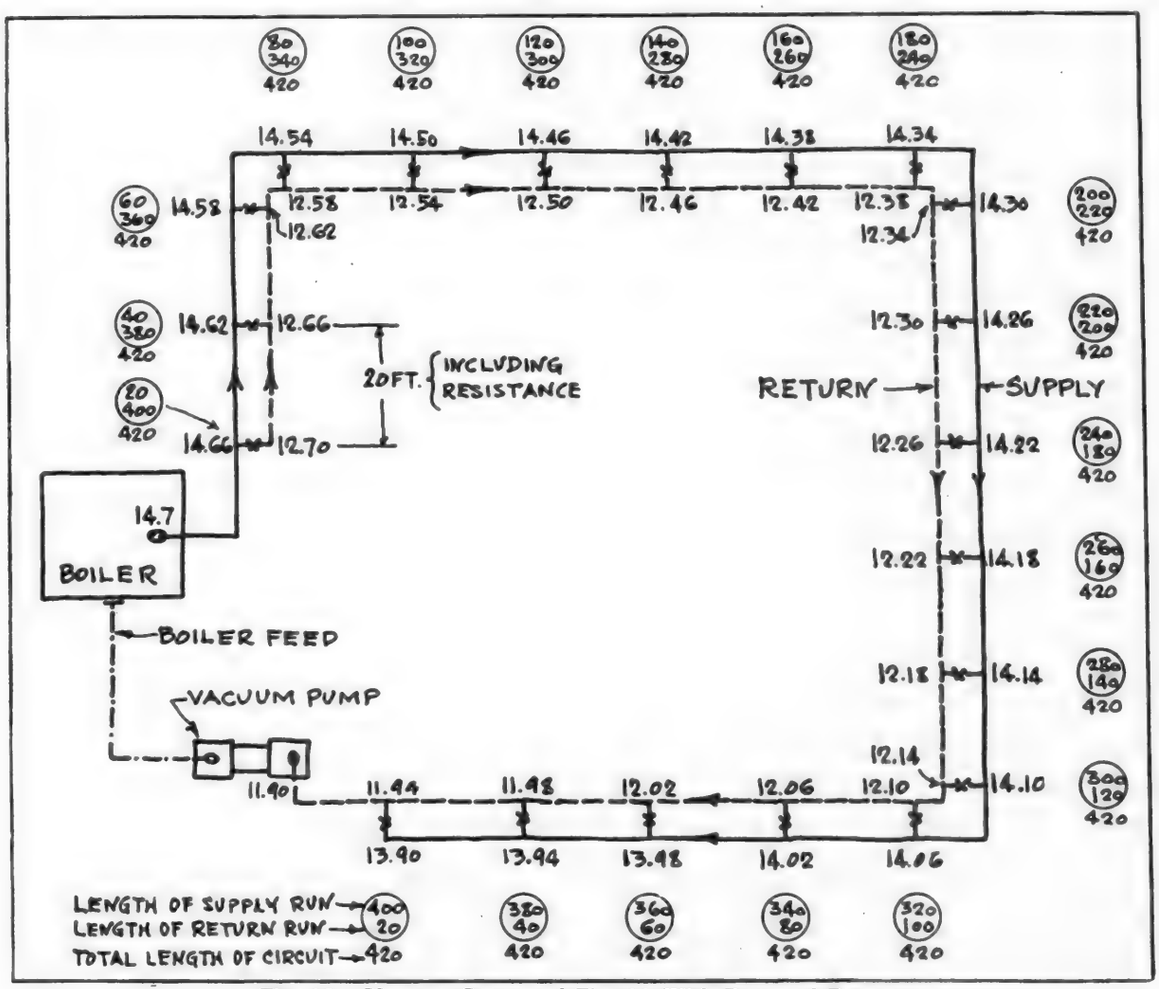


Fig. 12. Vacuum System of Fig. 11 With Reversed Return
Note that the difference in supply and return pressures for all points is the same, namely, 1.96 lbs., and that the total length of each circuit is 420 ft.—a thoroughly balanced system throughout.

serving the radiation or the steam main near the boiler discharge into the vacuum return line near the pumps, enough steam may be generated to fill the inlet piping to the pumps with steam, instead of water. Inasmuch as the usual make of pump is not designed to handle steam, it will simply churn without relieving the return main.

This steam pressure in the return main, therefore, is communicated to the far end, holding back water of condensation until this water builds up sufficiently high to balance the pressure, and the height may be such as to flood mains and radiation with water. By reversing the return of a vacuum system, we effect a low pressure (high vacuum) in the end of the return main where it connects to the steam main at a low pressure and, likewise, where the steam pressure is high, the return pressure is also high (low vacuum). This results in a decided reduction of superheat in the trap discharges, and a corresponding elimination of re-evaporation.

Quantities within circles in Figs. 11 and 12 indicate distances in feet, including the effect of resistance, that each cubic foot of steam travels in its course from the boiler to the respective connection and from the connection back to the return pump. The upper quantity represents length of run of supply and the lower, the length of run of return, while the quantity below the circle is the sum of the two or, in other words, the total circuit.

It will be noted that for the case of Fig. 11, the circuit for points near the boiler are very short compared with points near the far end of the main, while, for the case of Fig. 12, the lengths of all circuits are identical.

Due to the fact that each cubic foot of steam generated by the boiler has this fairly long travel (420 ft.), a considerable cooling action takes place in the returns, which renders re-evaporation less likely.

In hot-water systems, the superiority of the reversed return over other types has long been demonstrated, and it is often employed where uniform circulation is imperative. Some of the concerns making a specialty of certain types of low-pressure steam heating systems use the reversed flow return, recognizing, no doubt, that equalization of piping circuits is half the battle in successfully applying their specialties. And for vacuum return line heating systems, it seems more necessary than in any other type of heating system to balance the system by reversing the return.

In the vernacular of the practical fitter or mechanic who frowns at technical explanations, we may say: "Make the *first* connection off the supply main, the *last* one to return to the boiler, and vice versa, make the *last* connection off the supply main, the *first* one to return to the boiler."

Design of Heating, Ventilating and Cooling Equipment for Two Types of Theaters

III—Additional Factors to Be Considered When Balcony Is Added, With Notes on Air Distribution Between Balcony and Main Floor

By Harold L. Alt

IN the previous articles the design of the "picture" theater, that is, one without a balcony, was considered and the method shown of arriving at the desired results. In the present article the "vaudeville" theater will similarly be discussed.

The vaudeville theater as shown in Figs 7, 8, and 9, is of exactly the same size as the picture theater but has, in addition, a balcony which requires stairs at the rear of the main floor, as well as a wider stage. For this reason the building losses, as well as the cooling radiation from the walls and roof, will be exactly the same as before, but the electrical power will increase and the increased number of sittings will make the body heat and respiration greater. More air, therefore, will be required to remove the excess heat. The amount of cooling required for the fresh air and the amount of condensation resulting from this cooling will be greater than in the case of the picture theater.

In the vaudeville theater now to be considered, the seating capacity has been increased to 3500, which, with an allowance for standees, will make the maximum number of persons to be cared for about 3700. The heating will be the same as before so that the cooling can be taken up at once.

COOLING THE VAUDEVILLE THEATER

Referring to (2)* the radiation of heat from the walls and roof has already been found to be

(2a)	Theater proper	366,324 B.T.U.
	Entrance	17,836 B.T.U.
	Total	384,160 B.T.U.

and the roof radiation again will be 154,000 B.T.U., while the walls and glass also will hold the former amount of 230,000 B.T.U.

The heat supplied from the occupants has increased to (3a) 400 B.T.U. x 3700, or 1,480,000 B.T.U.

For the electric lighting a much larger allowance will have to be made but the average load is only about 25% of the full load so the heat supplied from this source may be taken as (4a) 3.14 B.T.U. x 100,000 watts x 25%, or 78,500 B.T.U.

*See Part I of this series, October, 1927.

The total heat which must be removed from the theater will now consist of

		B.T.U.
(5a)	Walls and entrance	230,000
	Roof	154,000
	Occupants	1,480,000
	Electricity	78,500
	Total	1,942,500

Allowing 4 cu. ft. of air to remove 1 B.T.U., the total air required per hour will be

(6a) 1,942,500 x 4, or 7,770,000 c.f.h.

and adding 10% for duct leakage and factor of safety this amount becomes,

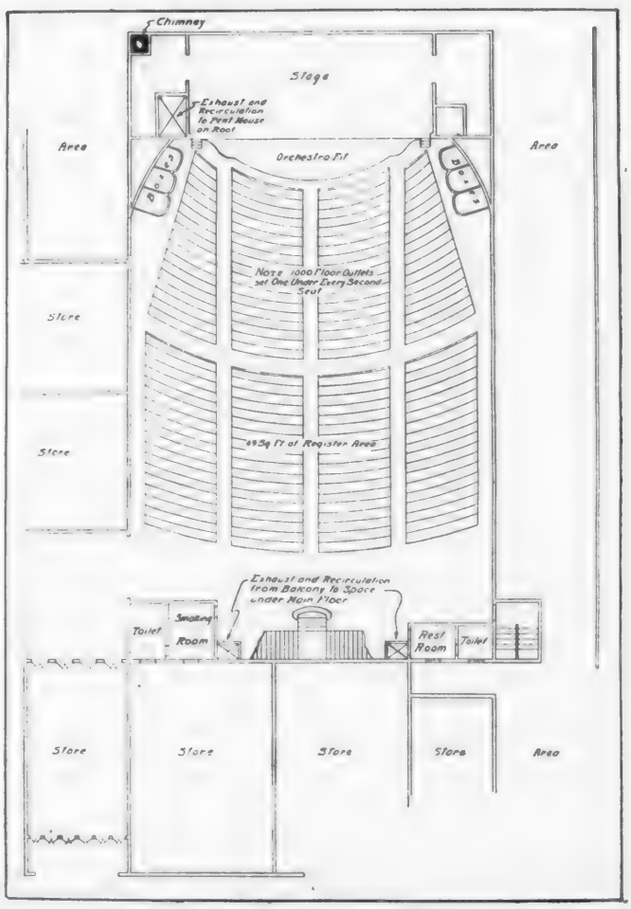


Fig. 7. Plan of Vaudeville Theater

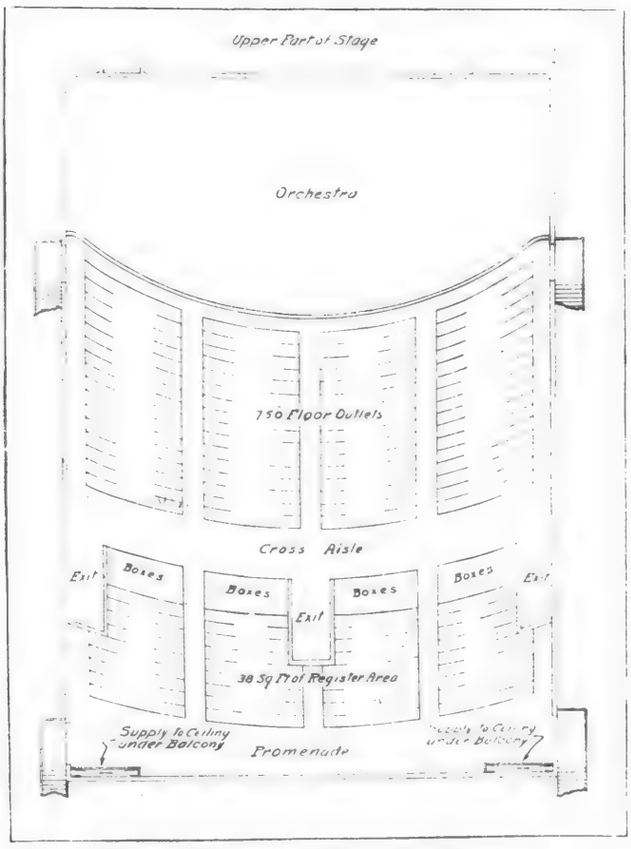


Fig. 8. Balcony in Vaudeville Theater

(7a) 7,770,000 plus 10% of 7,770,000, or 8,547,000 c.f.h.

Reduced to cubic feet per minute this becomes,

(8a) 8,547,000/60, or 142,450 c.f.m.

The actual cubic feet needed, when figured out in relation to the occupants, is

(9a) 129,500/3700, or 35 c.f.m. per occupant.

The fresh air required will be 25% of the total net air necessary for cooling, or 25% of 7,770,000 /60 which is 32,375 or say, 33,000 c.f.m. and the amount of recirculation will be 129,500—33,000, or about 96,500 c.f.m.

The amount of cooling necessary to reduce the temperature of this makeup air from the entering temperature down to the cooled temperature is

$$(10\text{-}1a)\ \frac{33{,}000 \times 60 \times 45 \times 0.75}{55} \text{ or } 1{,}215{,}000$$

B.T.U. and in dehumidifying this same amount of air the number of pounds of water taken out will be

$$(11a)\ \frac{33{,}000 \times 60 \times (8.56 - 4.07) \times 0.75}{7{,}000}$$

or 953 lbs., which, changed into B.T.U., at 1,000 B.T.U. per pound, will give

(12a) 953 x 1,000, or 953,000 B.T.U.

The B.T.U. released by the condensation moisture is now considerably larger, as will be noted by the following:

(15a) 3,700 x 0.106 x 1,000 x 75%, or 294,150 B.T.U.

All the quantities now are available for calculating the size of the refrigeration plant.

SIZE OF REFRIGERATION PLANT

Substituting the newly-calculated amounts, in place of those secured for the picture theater, except in the cases of roof and walls, the following is obtained:

(16a)			Tons of Refrigeration.
Roof (2a)	154,000/12,000	equals	12.8
Walls and Entrance	230,000/12,000	equals	19.2
Body Heat (3a)	1,480,000/12,000	equals	123.3
Electricity (4a)	78,500/12,000	equals	6.5
Cooling F.A. (10 1a)	1,215,000/12,0 0	equals	101.2
Dehumidification (12a)	953,000/12,000	equals	79.4
Respiration (15a)	294,000/12,000	equals	24.5
Total			366.9

Probably a 350-ton plant would be selected for use in this building in which case the ratio of tons of refrigeration to every 1000 occupants would be about 95.

For the vaudeville theater the cooling tower would be figured in the same manner as before, except to take into consideration the larger size of plant. With a 350-ton plant and 7½° cooling of the water going through the tower, the total amount of heat to be taken care of is

(17a) 350 x 12,000 B.T.U., or 4,200,000 B.T.U. per hour, which is equal to

(18a) 4,200,000/60, or 70,000 B. T. U. per minute.

The quantity of water required to be circulated per minute is the total B.T.U. divided by the B.T.U. absorbed per pound of water or

(19a) 70,000 B.T.U. / 7 ½ B.T.U., or 9,333 lbs. per minute.

This, changed to gallons per minute by dividing by 8 1/3 pounds is

(20a) 9,333 lbs. / 8 1/3 lbs., or 1120 g.p.m., which would require a 1200-g.p.m. cooling tower.

A cooling tower for this capacity would have a length of 84 ft., a width of 19 ft., and a height of 30 ft. Its weight would approximate 150,000 lbs. for the tower and about 70,000 lbs. for the water, making a total of 220,000 lbs., or around 110 tons load.

REFRIGERATION UNITS

A good distribution of unit capacity in the refrigeration machinery would be two 175-ton units or, possibly, one 150-ton, one 125-ton and one 75-ton unit. The circulating pumps would need to be divided up in the same manner as the machines and would have to handle a total of 1200 g.p.m. against the existing head.

If the apparatus is divided into two duplicate parts, the same as was done in the picture theater, there will then be two main fans which will be used as supply fans to cool the theater in summer. In winter one will be used as a supply fan and the other as an exhaust fan for ventilation. With this arrangement each fan will have a capacity of about half of the air required for cooling and all the air

required for ventilating. The amount of air necessary for cooling already has been found to be (8a) 142,000 c.f.m. and the amount for winter ventilation will be not less than

(21a) 3,700 x 20, or 74,000 c.f.m.

As this is about one-half of the air required for carrying out the necessary cooling, the apparatus on the roof may be divided into two sets of equal capacity and arranged as shown in Fig. 10. In this case—the same as in the picture theater—the idea would be to use both sets of apparatus at full capacity for cooling in the summer and to use one set in the winter for ventilation supply, running the other set as an exhaust, or else to use both sets for recirculation as an auxiliary means of warming up the theater in quick time during extreme weather.

Performance tables, for Sturtevant fans, as an example, show that a single-width, single-inlet, No. 13 fan will give 41,600 c.f.m. when run at 182 r.p.m. and with a tip speed of 3,400 f.p.m. A double-width fan, of course, will have twice this capacity or 83,200 c.f.m., which is more than is actually required. The net horsepower will be 28 H.P., so that a 35-H.P. motor would be used when operating at 1 ¼-in. static pressure such as occurs under summer conditions. In winter the speed could be cut down to about 139 r.p.m. at which the fan would deliver some 81,000 c.f.m. against a static pressure of 5/8 in., with a load of only 16 H.P.

CHANGES IN THE HEATERS

Owing to the increased quantity of air necessitated by the larger number of persons the heaters will have to be increased in size which, for the Vento, would be as follows:

(22a) 71,000/1,600, or 44.4 sq. ft. free area.

Using the same four rows as before, the initial temperature of zero will rise to 77° F. while passing through the heater. Reference to Vento performance tables will show that one tier of 60-in. Vento, 24 sections wide, will have a free area of 25.93 sq. ft. Therefore, if the heater is arranged in two tiers the total free area will be

(23a) 25.93 x 2, or 51.86 sq. ft.

which is more than sufficient. These stacks will be 10 ft. 9 in. wide and about 10 ft. high. It now only remains to check up the heater with the air-washer size for suitability.

Reference to air-washer data shows that an air washer can be secured in standard size for a rating of 79,000 c.f.m. and that this washer is 12 ft. wide, 9 ft. ¼ in. long, and 15 ft. 2 in. high. With 16 in. off the height for the pan, the height of the opening in the air washer will be 15 ft. 2 in., less 1 ft.

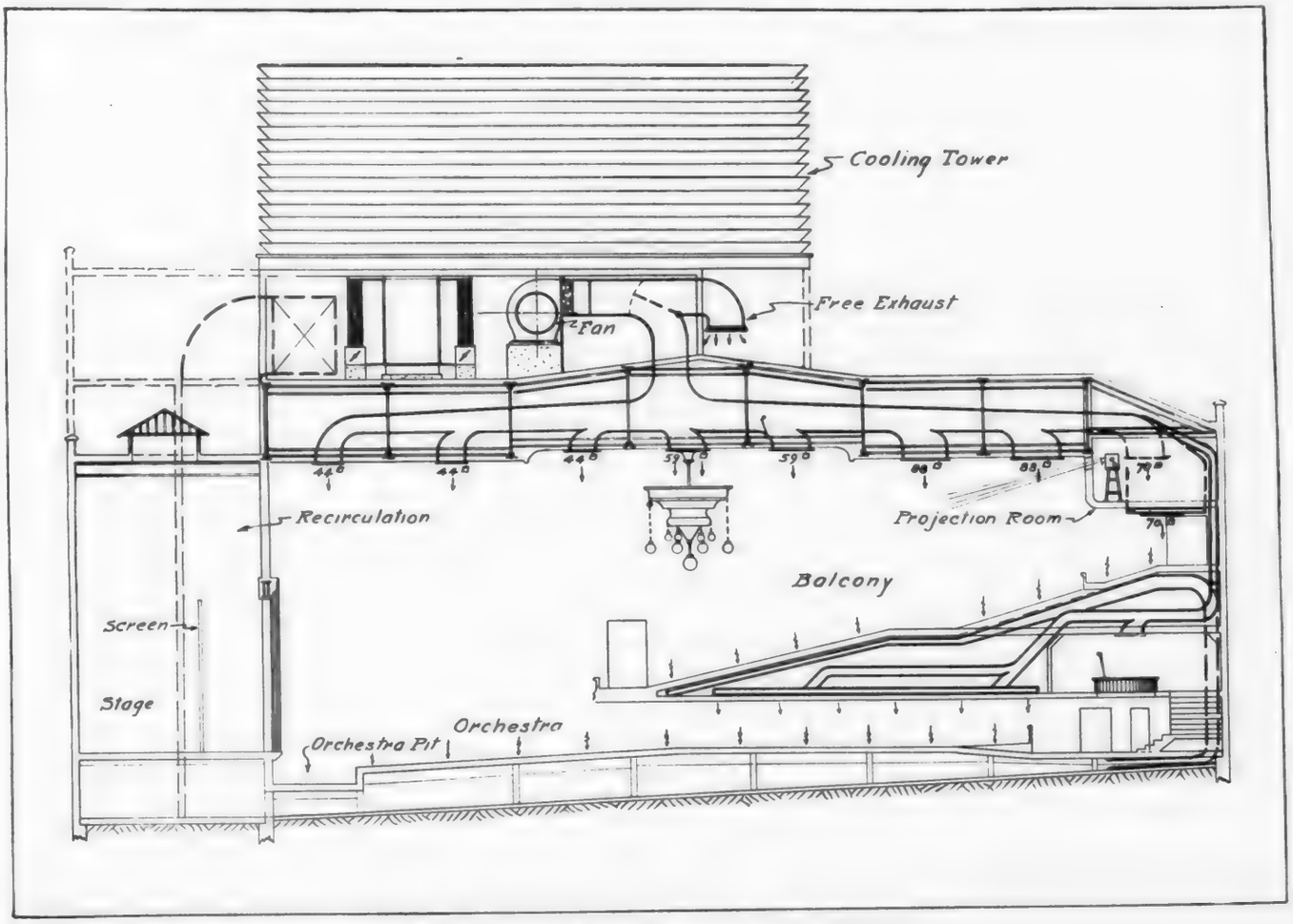


Fig. 9. General Section of Vaudeville Theater

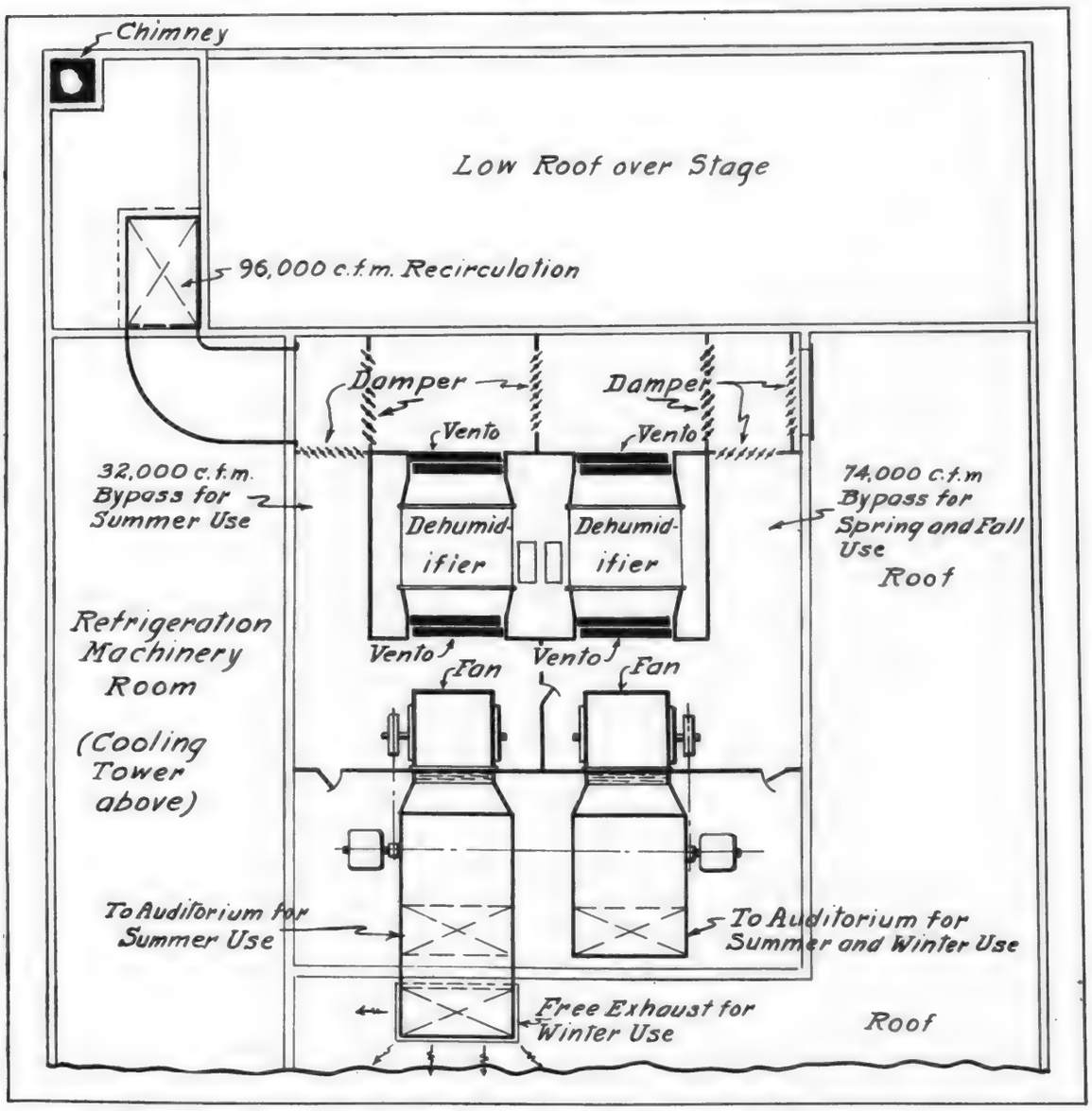


Fig. 10. Pent House Plan, Showing Modifications in Equipment for Vaudeville Theater

4 in., or 13 ft. 10 in. As the heater is 10 ft. high this will leave 3 ft. 10 in. under the heater for a by-pass, with the heater top set level with the top of the air washer.

As the temperature increase is the same as in the picture theater, the humidity will be the same.

With the larger heater the loads will be greater per row but will be only a little greater on the 60-in. stacks than before. In fact, most of the increase will come in the upper tier where the size of stack has been changed from 50 in. to 60 in. Of course, the addition of two sections on each stack will also add something, as will be shown. With the same temperature rises as before, viz., first row, 24° F.; second row, 19° F.; third row, 18° F., and the fourth row, 16° F., the equivalent direct radiation per row would be, for the first row:

$$(26a)\quad \frac{71{,}000 \times 60 \times 24}{50 \times 240} \text{ or } 8520 \text{ sq. ft.}$$

and, for the second row,

$$(27a)\quad \frac{71{,}000 \times 60 \times 19}{50 \times 240} \text{ or } 6745 \text{ sq. ft.}$$

while, for the third row, it is

$$(28a)\quad \frac{71{,}000 \times 60 \times 18}{50 \times 240} \text{ or } 6390 \text{ sq. ft.}$$

and, for the last row,

$$(29a)\quad \frac{71{,}000 \times 60 \times 16}{50 \times 240} \text{ or } 5680 \text{ sq. ft.}$$

On account of the fact that the stacks in both the upper and lower tiers are of the same height and number of sections this load will be divided equally between the two stacks and not on the basis of 5/11 and 6/11, as in the case of the picture theater. This will make the equivalent direct radiation for each stack as follows:

(32a) ½ of 8520 sq. ft., or 4260 sq. ft.
½ of 6745 sq. ft., or 3373 sq. ft.
½ of 6390 sq. ft., or 3195 sq. ft.
½ of 5680 sq. ft., or 2840 sq. ft.

With piping connections to each side of each stack, the load on each connection, of course, may be taken at just half of the above amounts, as there are two connections between which the load as

figured will be divided. If Aerofin heaters are used it will be necessary simply to increase their face areas so as to allow for the larger quantity of air, and it will not be necessary to go over this again here.

DISTRIBUTION OF AIR BETWEEN BALCONY AND MAIN FLOOR

In the vaudeville theater a new factor is introduced in regard to the distribution of the air. This is the fact that there is now to be considered the matter of two ceilings through which the air is to enter and two floors through which the air is to leave. As the human element is the greatest single cause of heat production during the time of cooling and the only factor to be considered during the time of ventilating, it would seem most consistent to determine the air quantity for each section on the basis of seats in that section.

If the seating capacity is analyzed it will be found that out of 3500 seats about 1400 are under the balcony and about 2100 are in the balcony or in front of the balcony on the main floor; 1400/3500 is, roughly, 40% and 2100/3500 is the remainder, or 60%. Therefore, if 60% of the air is put in through the main ceiling and 40% from the balcony ceiling, the air quantity will approximately be correct, according to the seating capacity under each ceiling.

Taking these percentages as a basis, it will be found that the amount of air to be introduced through the main ceiling is about 60% of 140,000, or 84,000 c.f.m., while the amount to be introduced under the balcony is 40% of 140,000, or 56,000 c.f.m. The balance of some 2000 c.f.m. can be put in the mezzanine between the balcony and the main floor.

To distribute the main-ceiling air around the main ceiling and with the same velocities assumed in the picture theater, the quantity per bay would be

(37a) 140,000/8 or 17,500 c.f.m.

and in the projection room bay there would be the same two-fifths to enter under the projection room floor and the same three-fifths to enter from the high ceiling at the sides of the projection room. This is

(38a) 2/5 of 17,500, or 7000 c.f.m.
3/5 of 17,500, or 10,500 c.f.m.

With a velocity of 100 f.m. through the registers under the projection room the area for registers would be

(39a) 7000/100, or 70 sq. ft.

while, for the high ceiling at the ends of the projection room, with a velocity of 150 f.m., the free area would be

(40a) 10,500/150, or 70 sq. ft. also.

For the next two bays in front of the projection room, with an outlet velocity of 200 f.m., the free area for registers would be

(41a) 17,500/200, or 88 sq. ft.

while the next two bays will require, at 300 ft. velocity,

(42a) 17,500/300, or 59 sq. ft.

All the bays from here to the stage at 400 f.m. velocity will need

(43a) 17,500/400, or 44 sq. ft. each.

It will be noted that the ceiling under the balcony is very low throughout so that great care will have to be taken in this portion of the work to avoid cold drafts on those sitting under the balcony. It has laready been calculated that 40%, or 56,000 c.f.m. of air, must come in through this ceiling and it would not be safe to use over 100 f.p.m. outlet velocity when so close to the floor. This will make the free-register area necessary in this ceiling 56,000/100, or 560 sq. ft. These registers could be incorporated in the ceiling in the shape of large panels of whatever shape would best harmonize with the ceiling ornamentation.

FLOOR OUTLETS

The floor outlets would have to be distributed in the same manner as the incoming air; that is to say, with 40% located under the balcony and 60% distributed between the balcony floor and the portion of the main floor in front of the balcony. Counting the seats in the balcony, it is found that there are about 1500; and 1500/3500 is 43%; so 43% of the air would leave through the balcony floor. Naturally, the remainder, or 100%—43%, which equals 57%, would leave through the main floor.

From this may be computed the air quantities of 43% of 140,000, or 60,200 from the balcony and 57% of 140,000, or 79,800 from the main floor.

It has already been shown that in the picture theater (44) each floor outlet can be counted upon to remove 60 c.f.m., so that the number of floor outlets in the balcony would be

60,200/60, or 1003

and, for the main floor,

79,800/60, or 1330.

If one floor outlet is placed under every second seat in the balcony and there are 1500 seats, this would give a removal of

1500/2 x 60, or 45,000 c.f.m.

leaving

60,200 — 45,000, or 15,200 c.f.m.

to be taken out by means of step registers. On the main floor, there would be (3500 — 1500) / 2 x 60, or 60,000 c.f.m. removed by the floor outlets, leaving 79,800 — 60,000, or 19,800 c.f.m. to be taken care of by step registers or registers in the boxes. With a velocity through these registers of 400 f.m., the free register area in the balcony would be

15,200 / 400, or 38 sq. ft.

while in the main floor would be required

19,800 / 400, or 49 sq. ft. of register area.

Of course, this area may also be provided by increasing the number of floor outlets to 1000 in the balcony and 1300 on the main floor, in which case the exhaust registers would not be necessary.

Heating and Ventilating Possibilities in South America

By S. Carrasco

First Prize Winner of THE HEATING AND VENTILATING MAGAZINE'S *Recent Moving-Picture Theater Competition**

IN compliance with the request of the editor of THE HEATING AND VENTILATING MAGAZINE, I wish to submit in the following article some information in regard to the actual practice of heating and ventilation in South America. I trust, therefore, that this information may reach the manufacturers and that it may prove of advantage to the industry generally.

The fact that I was engaged in this line of business with one of the best engineers and contractors in Chile, authorizes me to treat the subject with full understanding.

Any one who is not familiar with the climatic conditions in South America may find it strange to learn that the heating and ventilating field in some of those countries already has grown and developed to proportions well worth consideration. In Chile, for example, we have three different zones into which the country can be divided. (1) The northern zone, which comprises the provinces north of Coquimbo and where winter is unknown. Heating in this section is therefore unnecessary. (2) The central zone where the four seasons occur, as in this country, with rather a long, rainy winter, though not of a severe character.

CHILE'S MOST POPULOUS ZONE

This zone, which comprises the provinces between Aconcagua and Llanquihue, inclusive, being the most populated, the best developed and wealthiest section of the republic, up to the present time has offered the widest field for heating activities. (3) The zone south of the province of Llanquihue, being the coldest, doubtless in the future, with its growth in wealth and population, will also offer the greatest opportunity for further heating developments since they will here become necessities.

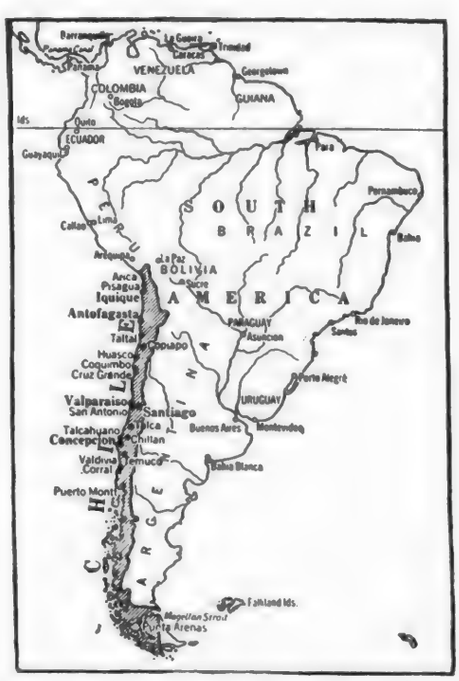
As stated above, the winter in the central zone is not severe. In Santiago, for example, notwithstanding the fact that it is situated at the same south latitude as New York is north, the temperature seldom reaches freezing point. The heating installations in that city are calculated to keep an inside temperature of 68° F. with 38° F. outside. This therefore would show that heating in this zone really is not a necessity. However, it is a convenience which nowadays is considered in almost every residence, hotel, office building, hospital, etc., that is being erected, and heating equipment is even being installed in buildings already constructed.

HEATING SANTIAGO'S FIRST SKYSCRAPER

The heating plant for the first skyscraper which was built in Santiago was figured out by an American engineer to maintain 70° F. inside temperature against 0° F. outside. The result was that the offices were overheated to the extent that the radiation had to be reduced one-half after installation had been completed, leaving the piping with all the disadvantages of too excessive a diameter. The installation has therefore a very low efficiency.

Perhaps one of the causes which has retarded the growth of heating activities in Chile has been the failure of contractors who, either through ignorance or to some extent lack of good faith, are responsible for unsatisfactory installations.

It has been my experience while in Santiago to dismount hot-water systems, finding 3/8 in. pipes where practice would require 3/4 in. pipes, in order to counteract the effects of rusting and of deposits that occur in every piping system.



Map Showing Why Chile Has a Variety of Climates

*Mr. Carrasco's solution was published in THE HEATING AND VENTILATING MAGAZINE for November, 1927.

One of Santiago's Attractive Residences

The failure of certain installations to give full satisfaction has been the cause of much of the loss of prestige which heating systems have suffered in Chile, it being the case that sometimes new prospects show distrust and do not wish to invest in an enterprise which proved so unsatisfactory to their neighbor.

Convinced as I am of the fact that in order to obtain the best results in whatever enterprise one enters upon, it is essential to have a thorough knowledge of the subject, I decided after having had two years' practice in my own country, to come to the United States with the purpose of specializing in that line, and, after having acquired a wider experience, to return to Chile to put in practice the latest developments in heating and ventilating.

UNITED STATES AS A SOURCE OF HEATING KNOWLEDGE

During my stay of a little more than two years in this country, I am better able to appreciate what a wise decision it was for me to have selected the United States to carry out my ambitions. Doubtless it is the country which has reached the highest peak of development and progress in this branch of engineering and I can safely say that the result of my visit has surpassed by far my own expectations. I wish to take advantage of this opportunity to acknowledge, through this important medium, the generous and unlimited help which was extended to me by the Chile-American Association; W. M. Cosgrove, of the American Radiator Company; and the Raisler Heating Company. I have been employed with the latter firm ever since my arrival in the United States and have met with every facility and the friendliest co-operation in perfecting myself in my profession. The wide range which the Raisler Heating Company covers in this city has given me full opportunity to practice in every type of heating and ventilating systems now in use in the different buildings.

HOT WATER SYSTEMS FAVORED IN CHILE

In Chile, up to the present time, the system more commonly used in residences has been hot water. This is probably due to the smoothness and easy regulation of the system from the boiler itself to meet the requirements of the outside temperature and also because the vapor and warm-air systems are not so widely known. In office buildings, banks, etc., we have used in preference the one-pipe steam system. I have no doubt that the vacuum system will soon take its place in the picture.

The materials for such installations so far have been imported from Europe and the United States and undoubtedly will continue to be imported for some time to come.

In boilers, the cast-iron sectional up to now has had the preference in view of its easy transportation and erection in buildings already constructed. In radiators, the classic or Corto has met with the approval of the architects in general, as well as with the favor of the housewife—the radiator's greatest enemy. Valves, pipes and fittings are those in common use in this country.

The American manufacturers might possibly increase their trade with South America were they to engage the services of some engineer who is familiar with the business to make a thorough study of the actual conditions and the reasons for the preference given to European manufacturers in that market.

One of the disadvantages of this country is undoubtedly the higher prices of its merchandise, due to the high cost of labor.

COMMERCIAL STABILITY OF CHILEAN CONTRACTORS

During my vacation I visited several of the best known factories of heating materials around New York. One of the manufacturers with whom I exchanged ideas about the possibilities of the sale of his goods in the South American markets, showed some distrust as to the reliability of the contractors and even of the banking system there. Ultimately he expressed the opinion that South America did not buy in the United States because it thought that the manufacturers here did not know how to pack.

None of these arguments has any foundation. The banking system in Chile at the present time is as stable as in the United States; the reliability of the contractors can very easily be investigated and, finally, if twenty years ago the American manufacturers did not know how to pack, it is hoped that in this lapse of years they have had ample time to overcome this handicap. But the fact remains that in Chile no one gives such a reason for not buying in the United States.

I recall a certain instance when the firm of A. Delano & Company, with whom I was connected before coming to the United States, had some difficulties with some fragile goods, such as lavatories, but, after giving due instructions to the manufacturers as to how the goods should be packed in future shipments, the trouble was overcome. This would show that co-operation at both ends can be of great mutual advantage.

(*Continued on Page* 81)

Second Prize Design in Picture Theater Competition

Features of a Well-Considered Arrangement Based on Simplicity and Cheapness to Install

IT was noted in the picture theater competition, conducted in THE HEATING AND VENTILATING MAGAZINE for September, that the second prize would be determined on the basis of simplicity and cheapness to install—in other words, on a competitive design which, while not ideal, would be sufficient to give a reasonable amount of ventilation without going into too heavy an initial cost and getting into complicated and elaborate apparatus. This second prize, as announced last month, was awarded to Vernon H. Walther, of Chicago, Ill.

Mr. Walther's scheme, in some ways apparently is similar to that awarded the first prize, but close inspection of the illustrations will show marked differences. In the first place, reference to the basement plan, shown in Fig. 1, indicates that no air washer, humidifier, or air-purifying apparatus is contemplated. In the second place, while using three air tunnels, only two of these tunnels are *supply* tunnels, these being the ones along the outside walls. The middle air tunnel is for *recirculation* only in winter.

Fig. 2, which is the main floor plan, has no ceiling registers contemplated, but, instead, uses outlets on the side walls which supply air to the theater from each side. In the summer the exhaust goes out through the ventilators in the roof which are indicated on the cross section shown in Fig. 3. The system, as proposed, is based on supplying 30 c.f.m. per occupant, this being *all fresh air* in the *summer* and *one-third fresh air* in the *winter*. The two-thirds of recirculated air used in winter comes back to the fan by means of the middle air chamber which is 40 in. x 36 in., and the one-third fresh air is procured from the fresh-air shaft. In the summer no recirculation is used, all the air coming from the outside and going out through the roof ventilators by natural action.

Although Mr. Walther does not expressly state that he is using a coal-burning, cast-iron, sectional boiler, the shape of the boiler that has been indicated and the coal storage provided would lead to that conclusion.

It also might be inferred that no direct radiation is proposed and that the ventilating system will also be used for heating purposes. This, however, is conflicting with the answer to the question, at what temperature the air enters the theater, which is given as 68° and 70° F. Therefore, it must be assumed that direct radiation has been in mind for heating although it is not indicated on the plans.

As a general description of his system Mr. Walther offers the following in answer to Question 20:

"In general, the system of ventilation for the auditorium of the theatre shall be sideward, with fresh-air supply distributed through plaster or iron grilles in the side walls. Exhaust or recirculated air shall be taken out through register faces located in floor under the center banks of seats. The main thought in mind was to utilize the building proper in the development of the system, namely, the foundation and exterior walls. The sideward distribution, as outlined above, is known to be most practical for small areas.

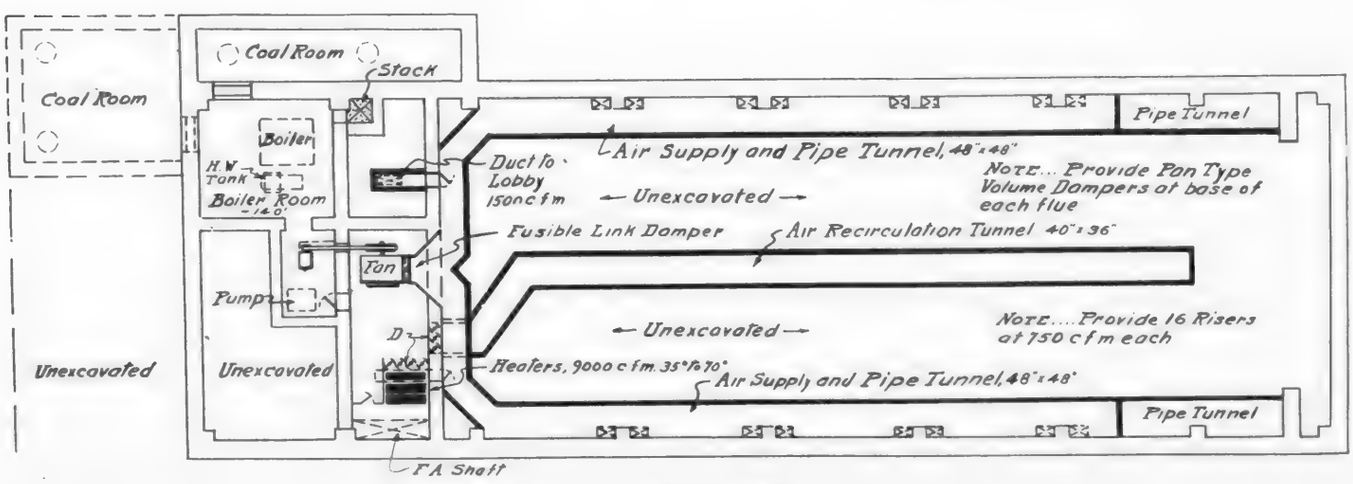


Fig. 1. Basement Plan

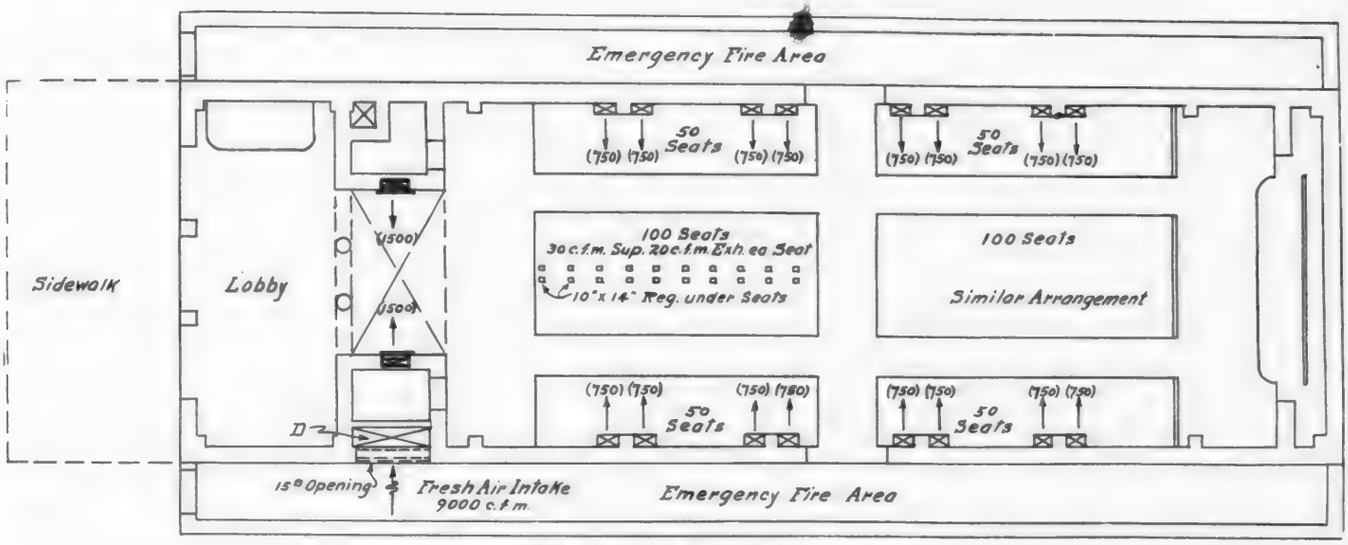


Fig. 2. Main Floor Plan

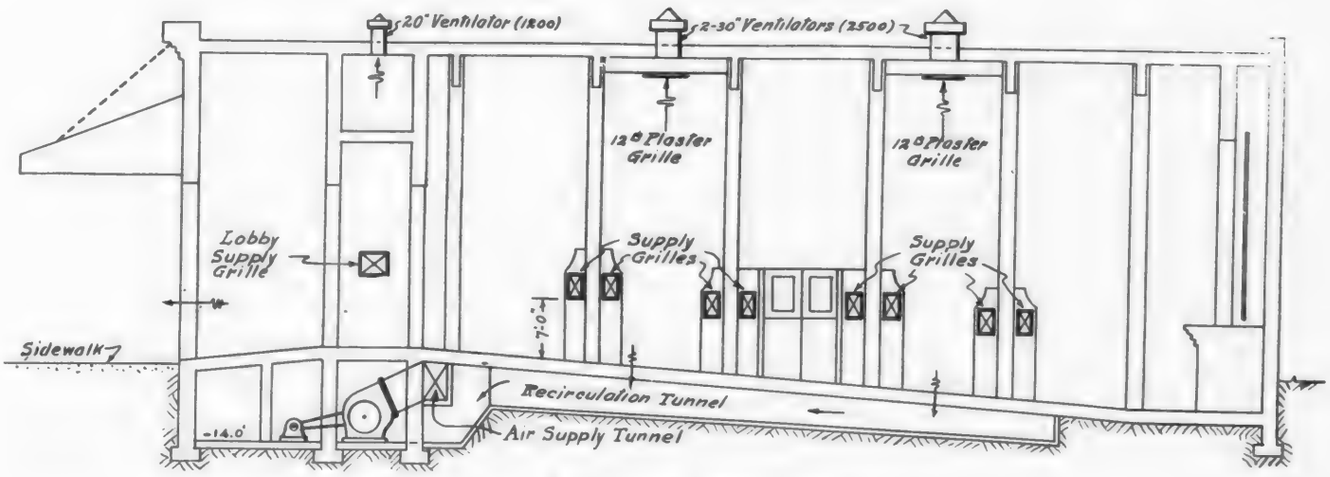


Fig. 3. Elevation Cross Section

"The feature of exhausting air from an auditorium where the air changes are numerous, and, utilizing same for final volume of supply fan, is found to be a great saving both in steam consumption and installation cost.

"The maintenance of this system could be handled by an ordinary boiler-room fireman in a satisfactory manner, this being advantageous to the house manager."

Heating and Ventilating Possibilities in South America

(*Continued from Page 79*)

CRATE MARKINGS SHOULD BE IN SPANISH

Another reason of loss through breakage of imported merchandise from the United States would seem to me to be in the little attention which is given here to the fact that we are a Spanish-speaking people. On every crate can be read "Handle Carefully," "This Side Up," etc., which indications are of so great importance in the handling of goods, but which to our laborer mean nothing since he does not read English. These marks should be in Spanish, to insure the safety and better handling of crates at the piers and R. R. terminals.

WHY AMERICAN SALESMEN FAIL IN SOUTH AMERICA

On the other hand the American salesman in South America is a failure. It should be kept in mind that the South American has his own way of transacting business and in many cases his methods are quite opposed to those of the North Americans. I believe that the salesman in South America should be well acquainted, not only with the necessities of the country, but with its customs as well, if he wishes to be successful.

My conviction is that the heating field in Chile has reached a point where it deserves due consideration on the part of the American manufacturers. As the buying power of the people increases with the growth and development of the country, as can already be seen, this convenience will not be merely for the comfort of the rich but within the reach of those with reasonable means as well.

This is the twenty-ninth lesson of
The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 29—Estimating Steam and Water Heating Jobs*

By Ara Marcus Daniels

An estimate, as prepared and submitted for a steam or water heating installation, may reflect good business methods or it may represent slip-shod methods of conducting a business.

A successful business requires forethought, effort and system, which, in turn, enable the owner to have a comprehensive grasp of affairs and to conduct the business in a profitable manner. Poor business methods are indicated by slovenliness and lack of system which, in turn, fail to afford means for a comprehensive understanding of how things are going, with a resulting hand-to-mouth business or, ultimately, failure.

Since submitted estimates are prepared by *some* method, be it good or bad, the estimate necessarily is an expression of the method used. Estimates rendered determine the financial return from each job and when grouped for a given period of time, determine the total gross income to the firm or individual. A deduction of expenditures necessary to install the various jobs, and the general expenses incident to the operation of the business over the same time, leave the net return which demonstrates whether operation has been at a profit or at a loss—whether the firm has been conducting a successful enterprise or one that is headed for failure. No part of any business is more important than that of the preparation of correct estimates.

ESTIMATES OF TWO KINDS

Broadly speaking, estimates for steam and water heating work may be considered under two methods: (a) the unit-cost method and (b) the detailed-cost method.

UNIT COST METHOD

By the unit-cost method, estimates are based on average costs per unit, such as the cost per fixture or cost per unit of capacity of the apparatus or cost per unit weight of certain equipment.

In steam and water heating, such estimates may be prepared on the basis of average cost of the entire heating equipment per cubic foot contents of the building, or the average cost of the apparatus in place per radiator installed or per square foot of radiation installed. It is better to use average cost per radiator installed or per square foot of radiation than a cost based on total heating equipment cost divided by the cubic feet contents of the building.

In computing average costs, separate computations should be made for material and labor, respectively. The cost of the boiler may be included in the average material cost or the unit cost of material may be computed exclusive of the boiler cost, remembering to add the cost of a suitable boiler to the estimate derived from unit-cost data.

Unit-cost estimates are properly prepared from data developed from carefully preserved and recorded costs covering a similar class of completed work. Thus, it is essential to keep strict and accurate cost of all items entering into each installation covering a definite period of time.

The preparation of these cost data is based on the law of averages. The different conditions encountered should be recorded separately and after a number of the same type have been installed, the results or costs of each condition should be totaled and averaged, by which average unit-prices are obtained.

CLASSIFICATION OF CONDITIONS

The first step in the development of a unit-cost estimating system is the classification of general conditions under which gravity steam and water heating systems are usually installed. Fig. HSE-1-1 shows a suggested outline for considering general conditions. This outline may be elaborated or condensed, depending upon the extent to which it is desired to develop this system of estimating.

After conditions on which data are to be tabulated have been determined and the basic unit of cost selected, suitable data sheets should be prepared for recording the data derived. A book, preferably of the loose-leaf type, should be used and

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data recorded therein as obtained. A separate page should be used for each condition selected and, as unusual conditions are encountered, new pages inserted. Each page should be properly headed and ruled. Fig. HSE-1-2 shows suggested items for a page of unit estimate data.

When data have been obtained for a sufficient number of similar installations, an average of the quantities may be used to obtain approximate estimates quickly for future installations.

To the estimate showing cost of materials and labor must be added a proportionate amount to cover overhead properly chargeable to the installation, and to the total thus obtained, a percentage of profit to the firm or owner commensurate with the ability to perform such work and responsibility for so doing.

Estimates prepared on the unit-cost basis may be found very useful when called upon to give an idea of about what the heating equipment for a given structure will cost and there will arise, among many engaged in or responsible for heating work, frequent opportunities to justify the time and effort expended in having such data available.

The use of such estimates, however, in the opinion of the writer, should be limited to those which, very properly, should be called "approximate estimates." Such should not be used as the basis for entering into a contract to install a guaranteed heating system. For such, a detailed cost estimate should be made.

DETAILED COST ESTIMATE

The preparation of a detailed cost estimate embodies, essentially, seven major parts, namely,

(a) a plan of how the work shall be done.
(b) a systematic setting down of the operations for carrying out the plan.
(c) the application of a labor charge for each operation.
(d) the preparation of a bill of materials by taking off quantities.
(e) obtaining and tabulating the cost of materials.
(f) the application of an overhead charge.
(g) the inclusion of a proper profit.

A properly-prepared detailed cost estimate must take up each of these steps, but not necessarily in the above sequence, otherwise the result will be a guess, rather than an estimate. Shrewd guessing on the cost of doing a job often is practiced with success for the time being by some having had long experience in handling certain work. Such practice, however, is advised against in all instances and any business that relies on this practice is conducted on a flimsy foundation and ultimately is doomed to failure.

Undoubtedly there are thousands of jobs let every year for heating work on which the contractor sustains a direct loss (although he may not be aware of it at the time) or makes practically no profit; and which may be due largely, if not entirely, to guesswork or the lack of system in preparing a bid.

Some approximations or, perhaps, what might be called guesses, are unavoidable at times. By systematic handling of estimates such can be reduced to a minimum so that if the guess or approximation is too low, its effect will not be of enough importance, materially, to affect the profits or the capital required for the job.

ESTIMATING CONDITIONS

In estimating heating installation work, two conditions are presented. Detailed plans and specifications prepared by the architect or engineer are supplied the contractor, or the estimator is required to make his own design and then estimate thereon.

In the former, the estimator is required only to make an estimate; in the latter, he must not only be able to estimate the cost of doing certain work, but must have the ability to perform all the engineering work which will form the basis of the estimate and constitute definite instructions for the actual installation.

The student of this course has been instructed on the preparation of designs from which an estimator may work, so this feature need not be further discussed and it may be assumed that the value of a carefully-prepared layout is appreciated.

Unfortunately, for the trade, in many cases heating contractors do not realize fully the advantages of having an intelligently worked-out plan, first,

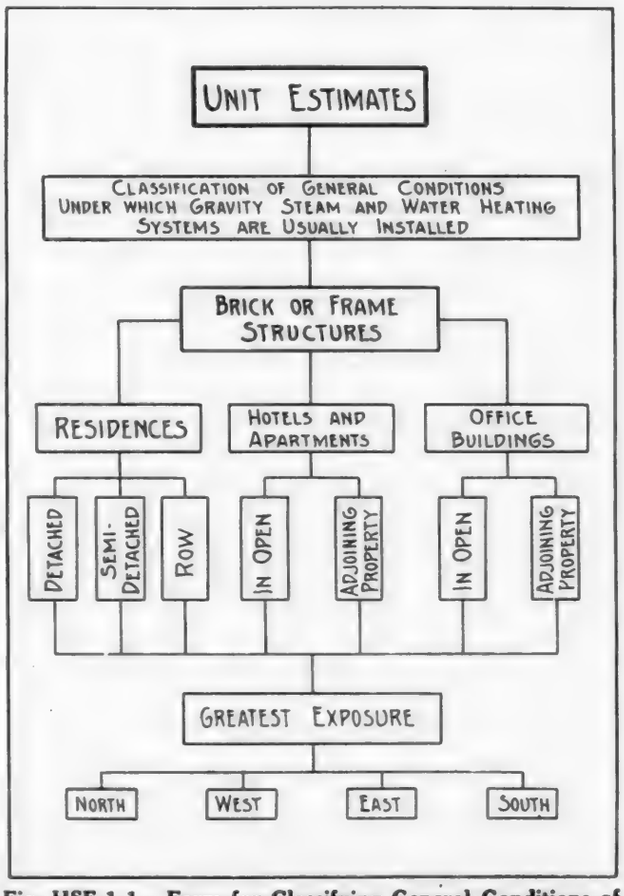

Fig. HSE-1-1. Form for Classifying General Conditions of Heating System Installation

STRUCTURE : _____ UNIT ESTIMATE
SITUATION : _____ DATA SHEET
EXPOSURE : _____ SYSTEM: _____

DATE INSTALLED	TOTAL NUMBER RADIATORS	ACTUAL COST MATERIAL EXCLUDING BOILER	COST OF BOILER	AVER. COST PER RAD. EXCLUDING BOILER COL. B / COL. A	AVER. COST PER RAD. INCLUDING BOILER COL. B+C / COL. A	LABOR REQUIRED FOR INSTALLATION			TOTAL LABOR COST PER RAD. COL. H / COL. A	TOTAL COST PER RADIATOR COL. B+C+H / COL. A
						JOURNEY MEN	HELPERS	COST TOTAL		
	A	B	C	D	E	F	G	H	I	J
TOTALS										
AVERAGE										

Fig. HSE-1-2. Suggested Form for Loose-Leaf Page for Recording Cost Data

on which to prepare the estimate and, second, with which to sell the owner on the estimate. No estimate can be sold properly unless the owner can be made to understand the value to be received for the amount of money asked. Thus, carefully-prepared plans serve to explain the value behind an estimate and present a reliable and systematic basis for determining material and labor quantities.

COSTS AND COST CARDS

Reliable data are essential to the establishment of any conclusion. No contractor conducts a profitable and successful business unless he knows his costs. Many estimators "carry" costs of construction operations in their heads and apply figures without knowing exactly whether they are "safe" so far as the cost to them is concerned or "safe" so far as selling the estimate is concerned. It is in the interest of good business to have a system of cost cards.

In preparing cost cards and establishing the cost for doing the work covered by that card, provision, preferably, should be made to show the cost for three working conditions, (a) most favorable, (b) least favorable, (c) average.

With ample room in which to work and plenty of light, either artificial or natural, most favorable conditions exist; where working space is limited and lighting poor, least favorable conditions exist; average conditions are what the term implies as compared to those described as most and least favorable.

COST OF INSTALLING BOILER

Before a boiler can be set it must be placed, that is, moved from the place of delivery to place of setting. It is difficult indeed to establish figures for placing a boiler which may be considered universal. Where narrow hallways, stairs and doorways are encountered, or entrance to the boiler room or basement is inconveniently arranged, or other unfavorable conditions exist, the placing charge is likely to run very high and unless the estimator considers such carefully, the labor cost of placing the boiler may equal or exceed his estimated amount for putting the boiler in place ready for the connecting of pipe lines thereto.

One method of estimating the placing cost is to have kept accurate records of time, and charge therefor, to place several boilers under the three working conditions stated above. Most favorable working conditions for this work may be considered as those where the surface is level, and the men may move about freely; where ample space is lacking and the boiler must be taken through some other room or hallway to reach the boiler room, least favorable conditions exist; where boiler has to be lowered into the boiler room and plenty of working space is available, average conditions prevail. By averaging the cost of the time required to place several boilers under the respective conditions, and dividing this average cost by the average weight in terms of 100 lbs. and this result by the average distance, in feet, moved, a representative "placing" cost factor in terms of cost per 100 lbs. per foot moved may be established.

Setting boiler cost factors must take into consideration the type of boiler, whether steel, cast-iron round or cast-iron sectional and capacity and weight of the boiler. With accurate record of hours required for several typical jobs and basic rate per hour for man and helper, very close estimating is possible. For those estimators who do not have cost cards on such work, it is advisable for them to take steps to prepare same and check

up on the figures which are being used in preparing their estimates. Some surprising things are likely to show up.

COST OF INSTALLING RADIATORS

Estimating costs to care for the distribution and setting of radiators presents a problem with ramifications. Methods of handling radiators in small buildings differ from those employed in larger structures. Favorable, unfavorable and average conditions under which they must be handled affect costs. Whether all may be handled as a unit as delivered or whether some need to be taken apart and reassembled in order to hold the labor of distribution to one man and helper must be considered in establishing the distribution charge. The distribution cost for placing a radiator on the third floor will be more than where it is located on the first floor. Weights of radiators play an important part. In the larger buildings, hoisting and floor handling present problems peculiar to the conditions.

Setting costs are less confusing. Generally, no allowance is made for putting leg column radiators in place. A charge, though, must be included where wall, legless or indirect radiators are to be installed, for placing hangers, brackets, etc., and for hanging or installing the radiators thereon.

In developing cost cards on radiator distribution, the degree of detail to which an estimator may wish to go will determine the characteristics of such cards and the basis on which they are prepared. There should be a card for radiator distribution complete for small buildings and another for large buildings. A suitable unit on which to base a cost factor for small buildings is 100-lb. weight. The same unit may be used for large buildings or the estimator may make other selection. The cost factor as developed for large buildings should include a factor to cover such delivery charges as must be borne by the contractor, such as delivery to the hoist, rental or service charge for use of the hoist and trucking charge according to the floor on which the radiators are distributed.

Most favorable, least favorable and average conditions should be considered for the small house distribution cost card, for costs will differ according to the care that must be exercised and the degree of ease with which the radiators may be handled. It takes considerably longer to move radiators up narrow, steep stairways than where the rise is easy and the treads wide. The contractor always is required to observe and avoid marring highly-polished floors or injuring carpets thereon. The additional labor required for distributing radiators to upper floors is obvious. Generally speaking, it costs twice as much to place a radiator on the second floor as to place it on the first, and about three times as much to put it on the third floor. With these relatively small factors improperly considered, the aggregate cost for distributing even for a moderate number should amply be covered. The failure properly to estimate the innumerable small items very readily can "eat up" a good part of the profit. With adequate cost cards before the estimator, this danger is reduced to a minimum.

In preparing radiator-distribution cost cards, in addition to the unit-weight, time, location and cost items, the labor rate charge on an hourly basis which was used should be shown, together with such notations as may be required to show other costs properly chargeable to radiator distribution, such as elevator and hoist charges.

The principal factors that affect the cost of radiator distribution are shown graphically in Fig. HSE-1-3, and, together with the foregoing, will prove useful in the establishment of a cost-card system.

Other items in connection with cost estimating will be discussed next month, including cutting and threading pipe, cutting walls, ceilings and floors, cost of setting radiator valves and traps and cost of making-up smoke pipe.

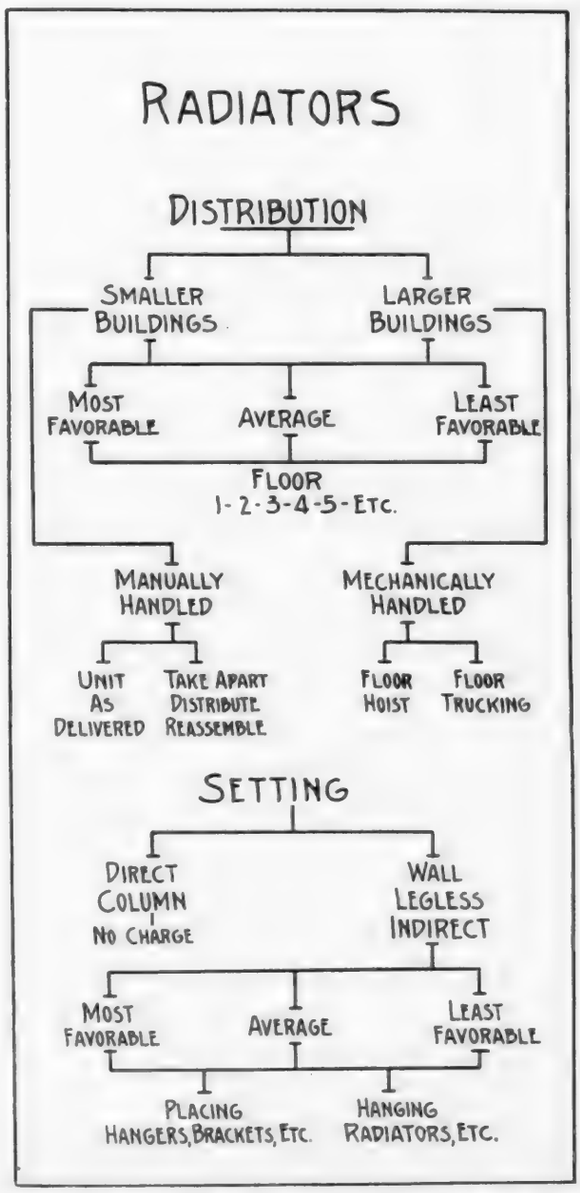

Fig. HSE-1-3. Diagram of Factors Affecting the Cost of Radiator Distribution

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IN reaching an agreement upon steam-riser capacities for one- and two-pipe systems, the American Society of Heating and Ventilating Engineers and the Heating and Piping Contractors National Association have taken a significant step forward in the standardization of heating practice. For years the heating engineers have gone along independently with proposals which had plenty of merit but which lacked the acquiescence of other branches of the industry. In the course of time, and perhaps because of this state of affairs, the contractors undertook to devise a standard code for testing heating systems. It so happened that those active in the movement were engineers, as well as contractors. In due course, their efforts bore fruit in the publication of the so-called "Engineering Standards" of the H. & P. C. N. A., providing, among other things, a method of calculating radiation. These standards, it was hoped, could be established so that in cases where contractors were called upon to guarantee that the radiation in a given case was the correct amount, they could offer as evidence the fact that the radiation had been computed in accordance with the standards adopted.

Even while "Engineering Standards" was being formulated, the A. S. H. & V. E. was busily engaged on its monumental "Code of Minimum Requirements for the Heating and Ventilation of Buildings," one section of which contained an elaborate method for figuring radiation. The situation thus created of having two "standard" radiation estimating methods remains to this day.

Further, each organization has developed a scheme for rating low-pressure heating boilers which has entailed an enormous amount of work and which has yet to win the support of the manufacturers. With two such classic examples of divided effort, it would seem that no argument was necessary to demonstrate the advantages and, indeed, the necessity of correlating the work of these two bodies in all matters pertaining to standardization of engineering practice. There is no novelty in this proposal. Many members of both organizations, no doubt, have felt the urge for united action. As far back as July, 1924, THE HEATING AND VENTILATING MAGAZINE, in commenting editorially on the situation, said:

"It is going to require some cool and clear-headed handling to develop the proper atmosphere for bringing together the two principal interests involved. If we could just forget the matter of precedence and consider what the object is in the undertaking itself, we believe it would be possible to iron out the differing viewpoints. Certainly that is the sensible thing to do, and no one man's or one committee's views should be permitted to stand in the way. It has become a matter now for the governing bodies of each organization."

IN view of what has transpired in the case of the pipe-capacity tables, it is a matter for wonder that heating engineers and contractors have not co-operated to a greater extent through their organizations. Here are two virile bodies with many interests in common, whose united voice would come pretty close to expressing the mind of the industry. Yet, until now, they have never spoken unitedly. It is gratifying to see the recognition given in the *Official Bulletin* of the H. & P.C.N.A. to the possibilities in this connection. In the November issue, commenting on the agreement reached on pipe-riser capacities, the statement is made: "It is to be hoped that it will be but the first step in bringing out other material with the endorsement of these two great bodies, for all the engineering data published in this way will undoubtedly find ready acceptance, not only on the part of the heating industry itself, but also on the part of related interests, such as the architects, the American Gas Association, and even the law courts of our country.

"The position of both organizations is strengthened by such agreements and we hope that this will be only the first step in correlating all the data needed for the design of a heating system."

Insulation Manufacturers Adopt A. S. H. & V. E. Code for Testing Insulating Materials

AN important action taken by the National Association of Insulation Manufacturers, at its September meeting in Chicago, was the adoption by that body of the A. S. H. & V. E. Code for Testing Insulating Materials, which was "tentatively accepted" by the A. S. H. & V. E. at its summer meeting in White Sulphur Springs, last June. The code is subject to alteration before it is finally adopted by the society, but it is thought that these changes will not materially alter the requirements.

Following is the code in full, as drawn up by the committee consisting of Prof. A. P. Kratz, chairman, of the University of Illinois; Prof. G. L. Larson, University of Wisconsin; J. K. Peebles, Armour Institute of Technology, and Director F. C. Houghten of the A. S. H. & V. E. Laboratory. In presenting the code, the committee stated that it was not framed for the purpose of offering detailed instructions for testing the heat transmission of building materials, or for constructing testing apparatus, but rather for defining certain standards, the application of which, it is hoped, will bring the results of different investigations into better conformity than is found at the present time.

DEFINITIONS AND FORMULAS

(1) The coefficient of heat transmission is the heat transmitted per square foot per degree F. difference in temperature from the *air* on one side of the wall to the *air* on the other side, per hour.

(2) The surface coefficient is the heat transmitted per square foot per degree F. difference in temperature from the *surface* of the wall on one side to the *air* on the same side, per hour.

(3) The coefficient of conductivity is the heat transmitted per square foot per degree F. difference in temperature from the *surface* on one side of the wall to the *surface* on the other side per hour per inch of thickness. This coefficient is of doubtful significance except in cases of solid walls of homogeneous material.

Let U = coefficient of heat transmission

K_1 = surface coefficient on hot side

K_2 = surface coefficient on cold side

C = coefficient on conductivity

W = watts electrical input

H = B.T.U. transmitted per hour = 3.4145 W.

A = Area perpendicular to flow of heat, sq. ft.

X = thickness of wall, in.

t_h = temperature of air on hot side, deg. F.

t_c = temperature of air on cold side, deg. F.

t_1 = temperature of hot surface, deg. F.

t_2 = temperature of cold surface, deg. F.

Then

$$U = \frac{H}{A(t_h - t_c)}$$

$$K_1 = \frac{H}{A(t_h - t_1)}$$

$$K_2 = \frac{H}{A(t_2 - t_c)}$$

$$C = \frac{HX}{A(t_1 - t_2)}$$

SPECIMENS FOR TEST

(1) The test specimens shall be constructed similarly to actual walls, and not consist merely of plates of the separate materials forming the walls. Such wall specimens shall be constructed to conform to the standard specifications of the manufacturers of the products used, and according to the usual practice of the trade employing average skilled labor.

(2) The portion of the specimen through which the flow of heat is actually measured shall be at least 3 ft. by 3 ft.

STANDARD METHOD OF TESTING

The standard method of testing shall be by means of the guarded hot box as described by F. B. Rowley in the *Journal* of the A. S. H. & V. E., Vol. 32, No. 5, May, 1926. The standard temperature range from air on one side to air on the other shall be 80° F. and the standard mean temperature of the wall shall be 40° F. All tests shall be run with still air on both sides of the wall, or the circulation on the inside of the box restricted to an amount just sufficient to obtain uniform temperature throughout. The box shall be under heat for a sufficient time previous to the start of the test to insure that temperature equilibrium has been attained. The test should continue for a sufficient length of time, and enough observations should be made to present evidence that such temperature equilibrium has been maintained throughout the test, and that the temperature in the space between the boxes has remained the same as that in the inner box. In general, the duration of the test should be at least two hours, and need not be more than four hours.

It is strongly recommended that coefficients of heat transmission be obtained with the standard temperature range of 80° F. for several mean temperatures of the wall. In all cases both the temperature range and the mean temperature of the wall should be stated in reporting results, and in no case where but one determination is made and reported should the mean temperature of the wall exceed 105° F.

Sufficient data should be taken to permit reporting on the surface coefficients for both hot and cold sides of the walls and in case of walls of elementary materials, the density or weight per cubic foot, and the moisture content should be stated. The coefficient of conductivity may also be reported, but this is of doubtful practical value unless the wall consists of a solid homogeneous material.

CONSTRUCTION OF GUARDED HOT BOX

The internal dimensions of the outer box shall be at least 5 ft. × 5 ft. × 5 ft. and those of the inner box 3 ft. × 3 ft. × 3 ft. The walls of the outer box shall be insulated with 3 in. of corkboard, or the equivalent, and the walls of the inner box with 2 in. of corkboard or the equivalent. The wall specimens shall be clamped to the open side of the outer box and in this position must come into firm contact with the edges of the open side of the inner box. These edges shall be thinned down or armored to insure perfect contact. The air in the inner box shall be heated by means of a resistance coil wound on a cubical frame not to exceed 12 in. on a side and with characteristics such that the wires, or units, do not attain a dull red heat, or so shielded that the test specimen does not receive radiant heat from surfaces at a high temperature. The current to the coils both in the inner box and in the space between boxes shall be thermostatically controlled to maintain the same temperature in the inner box and in the space between boxes. Fans shall be installed to maintain uniform temperature in all of these spaces with the minimum circulation of air.

LOCATION AND CHARACTER OF MEASURING INSTRUMENTS

All temperatures shall be obtained by means of copper-constantan or iron-constantan thermocouples, and the use of a potentiometer, rather than a galvanometer or millivoltmeter, is strongly recommended. All couples in the same space with the heating coils shall be shielded against direct radiation from the coils.

The temperature of the air in the inside box shall be obtained by means of four couples placed 6 in. from the inside of the face formed by the test specimens. The surface temperatures of the wall section shall be obtained by means of four couples imbedded in each face of the portion of the test wall enclosed within the edges of the inner box. The junctions of these couples and 4 in. of the leads back of the junctions, shall be embedded in the surface of the material under test, glued or cemented firmly in place, and filed flush with the surface. One thermocouple shall be placed in the air in each of the air spaces enclosed between the walls of the inner and outer boxes.

ALTERNATE METHOD OF TESTING

As an alternate method of testing, the Nichols heat meter, as described in the *Journal*, Vol. 30, No. 1, January, 1924, pages 35 to 70, may be used. When this method is used, all specifications in reference to test specimens, temperature ranges, mean temperature of material, and air circulation over the surfaces, as outlined in Sections (3) and (4) in this code shall apply.

CONDUCTIVITY OF INSULATING MATERIALS

Since methods for the use of the meter for determining fundamental constants for insulating materials has not been well developed and since the meter appears to give promise of advantage in making such determinations, it is recommended that a study be made of its application for the purpose of standardizing its use.

The guarded hot plate shall be the standard method for determining the conductivity of insulating materials. The temperature of the surfaces of the materials shall be regarded as that of the plates on each side. Temperature equilibrium shall have been established for a sufficient length of time to insure constant conditions before test data are taken. There are two factors which affect the results obtained: (1) mean temperature at which test is made, (2) moisture content of the material.

In order that results from different laboratories may be comparable, the standard method of making and reporting the tests shall be at a mean temperature of 60° F. and upon dry material. The material shall be dried at a temperature of 220° F. for a sufficient length of time to eliminate all moisture before test is made and the per cent of moisture driven off together with the atmospheric conditions shall be reported with the test.

Comparative Conditions Here and Abroad in the Field of Air-Filter Engineering

By Arthur E. Nealy
Midwest Air Filters, Inc.

A STUDY of comparative conditions in the field of air-filter engineering, here and abroad, reveals a very interesting condition, complimentary in no small degree to the genius and initiative of American heating and ventilating engineers.

Air-filter engineering, one of the world's newer sciences, finds its chief exponents in this country and Germany. The development of the science, or industry, as some prefer to call it, might be said to have progressed simultaneously in both countries. Here, however, the comparison ceases. In Germany, practically the entire development of air filters has been for industrial purposes and for the benefit of machines, rather than human beings. In the United States, on the contrary, the chief development and sale of air filters has been for purposes of building ventilation; in other words, for the benefit of human beings. This is due to the efforts of ventilating engineers, architects and manufacturers of air-filter equipment in this country, who early saw the value of filtered air for sanitary reasons.

Just what the exact relation between the use of air filters for industry and the use of air filters for building ventilation is, no one is in a position to say; but the relation would stand somewhere around 100 cu. ft. per minute used in building ventilation for 15 or 16 cu. ft. per minute used for industrial purposes in this country. In Germany, statistics of the principal air filter manufacturers show a reversed ratio, there being less that 15 c.f.m. used for building ventilation for every 100 c.f.m. used for industrial purposes.

Air-filter manufacturers and ventilating engineers are now awakening to the need for filtered air not only for human beings, but also for machines in certain kinds of industrial plants, and are embarking upon a campaign to bring about a better situation. Scientists have found that in Berlin alone over ten tons of dust are deposited in the streets every day. French scientists have discovered that, on a Sunday, in a busy street of Paris, there are as many as 460,000 injurious germs to one cubic meter of air. It has been found that the average street air of 32 German cities averages 2 66/100 milligrams of dust to the cubic meter. This amount, however, is increased in the case of office buildings to 4 72/100 milligrams, in warehouses to 7 80/100 milligrams, in motion picture houses to 12 26/100 milligrams and in schools to 17 85/100 milligrams per cubic meter. Of course, the number of disease germs increases in like proportion.

No less than 1,225,000 bacteria were found to the cubic meter of air in the famous Louvre Museum of Paris, *after visiting hours!*

AN OPPORTUNITY FOR VENTILATING ENGINEERS IN THE FIELD OF FACTORY VENTILATION

Air-filter building ventilation in this country is confined almost entirely to imposing structures, such as skyscraper office buildings, hotels, hospitals, etc. But how about the opportunity and need for filtered air in industrial buildings where the manufacturing process burdens the air with many times the number of dust particles normally found in the above-mentioned buildings?

Of course, there are two distinct uses for air filters in building ventilation, as developed in this country. The first, as above mentioned, is for sanitary reasons; the second is for economy in upkeep and the saving of costly fixtures, etc. In this connection, air filters produce immediate tangible results. But results of equal importance, although perhaps not quite so tangible, are to be obtained by the use of air filters for industrial ventilating purposes, and the opportunity for business in this direction is great.

The purification and cleaning of air in factory buildings eventually will become a moral duty for employers. It is, economically speaking, a paying enterprise for the manufacturer. An American statistician has computed for Pittsburgh that the damaging effect of dust alone amounts to $10,000,000. That is $20 per head of the population. If this is the case in Pittsburgh as a whole, what must be the situation inside of the factories producing this dust? The attitude that has brought about electrification of railroads and various other civic improvements inaugurated by private concerns eventually will result in the elimination of the dust menace by means of filtered air.

It is estimated that the dust content in a paper mill averages about 23 milligrams per cubic meter of air, in a steel grinding plant 24.8, in a foundry 141.0, and in sack storage plants 163 to 685 milligrams per cubic meter of air. Carrying the statistics a little farther, we find that a workman inhales, during 30 years of labor, 900 grams of dust in the case of a wool factory, 1560 grams in a flour mill and 7710 grams in a gelatine factory. Does not this prove the need for filtered ventilating air in the industrial field?

Service and Maintenance of Oil Burners for Large Heating Boilers

Where Manually-Controlled Burners and Low-Grade Fuels Are Used the Upkeep Is Surprisingly Low

ASIDE from obviously biased "estimated" data presented by interests inimical to the use of oil fuel, the writer knows of nothing definite in the way of figures showing just what may be taken as an average cost of servicing and maintaining that type of burner using the heavier fuels and firing large heating boilers. These burners, of course, are under manual control and the fuels range from 12°-14° "Mex." to 18°-24°, or whatever the market affords.

The desirability of oil as a fuel for heating hotels, office buildings, apartment houses, and the like, usually does not involve a consideration of the same factors that govern the problem when applied to domestic heating. Actual fuel cost, taking into account the efficiency of combustion, is the dominating measure. In some cases oil is cheaper, sometimes this fuel cannot compete with the smaller sizes of anthracite, and often it is nip and tuck between them.

Convenience and cleanliness, important factors in the domestic oil-burner application, are not generally paramount, although in certain instances they tip the scales.

Superhuman functioning of automatic controls, when they work, and the necessity for service when they don't, are replaced by the human element involved in control by janitor and unlicensed engineer types, and by reduced service requirements because of the simplicity and ruggedness of the equipment. The super-sensitiveness of the domestic burner to changes in oil characteristics, especially where constantly recurring ignition is necessitated, is paralleled by the careful readjustment of the manually-controlled burner that may be required with a change in fuel.

While steam for heating purposes usually is generated in low-pressure boilers, yet, for various reasons, high-pressure boilers may be used, although practically all of the output immediately is reduced to low-pressure. Such is the case in the Municipal Building in New York, where the boiler pressure is 125 lbs., and some 94% of the steam is reduced to pressures suitable for heating. As a result of this condition, the application of oil burners to high-pressure boilers does not immediately remove the installation from the realm of the heating industry—it becomes a heating job, regardless of the generating pressure, if the steam is used for heating purposes.

AN analysis of the maintenance costs of 150 commercial-type oil burners, that have been firing heating boilers from one to four heating seasons, shows the average annual expenditure to be $11.40 per installation—and some of the installations have six burner units.

Sixty-nine installations, costing over a quarter of a million dollars, had repair and service bills of only $2003 in four years.

The average annual maintenance works out to be about *three-quarters of one per cent* of the installation cost.

Many of these jobs operate through one, two, three and four years without a single service call or repair part purchased.

This article provides valuable information for those interested in the application of oil to large heating installations.

SERVICE AND REPAIR COSTS ON OVER TWO HUNDRED BURNERS

The data, analysis and discussion that follow cover nearly 100 installations in the Metropolitan district, in which there are in operation nearly twice that number of pump units and 205 burners. It would seem that averages on this number of units fairly represent current practice.

The minimum job is one in which a single burner unit is supplied with oil from a pump set, with a duplicate pump unit as reserve; this type of installation represents about 25% of the total number under consideration. The largest installations consist of duplicate pump sets and six burner units. The costs, as installed, range between $2200 and $15,000, with an average cost of $3800. It must be appreciated that the increased cost, in the largest installations, is materially affected by the tankage problem, consequently the maintenance costs would not vary directly with the contract price of the jobs. The aggregate installed cost, then, of the burners under survey, is approximately one-third of a million dollars.

Twenty-eight installations have functioned for two years without the manufacturer's supplying a single repair part, and with no service calls. This represents approximately 30% of all jobs listed. There have been no service calls for 20 other installations, or 20% of the total, during the heating season, the calls coming during the summer when the burners were being gone over for the coming season. For some among this group of burners small parts were ordered from time to time, such as motor brushes and coupling parts, the replacements being made by the operator. The normal repairs made to the burners, included in this latter group, consisted of summer overhaul, cleaning fans, packing pumps, replacing ball bearings and couplings and looking over the motors. The average cost for this overhaul was $20.

Service calls for repairs requiring immediate attention were limited to less than 15 installations, and it is estimated that three-quarters of these calls were occasioned by negligence on the part of the operator, in failure to lubricate, or to swing the burner from the firing position when it was shut down. This latter carelessness results in damage to the atomizing cup, when in position and not operating, from the heat radiated by the refractory walls of the combustion chamber. Some of these jobs, under careless supervision, had as many as three or four such calls in a single season.

Calls for operating difficulties requiring immediate attention, in most cases were from the same jobs that had experienced mechanical troubles due to negligence. With 95 installations in service during the heating season of 1926-27, there were less than 25 such calls, and 20 of them obviously were due to incompetent attendants.

"HUMAN EQUATION" A VITAL FACTOR

It is important to note the significance, in the matter of service, of the individuality of the attendant on the job. It is not customary or necessary, on installations of this kind, to use licensed engineers, but it is vitally important that the attendant have rudimentary intelligence and docility. Fuel economy, maintenance costs, and, in general, the satisfactory operation of the oil-burning equipment, with its consequent effect upon the relations of manufacturer and purchaser, often are entirely at the mercy of the passions and prepossessions of the individual in charge of the system. The "smart" engineer has been entirely responsible for more than one scar upon the reputation of oil-burner manufacturers, simply because he would not follow instructions or attempt to study and grasp the principles involved in the operation of the oil-burning system.

Without a single exception the installations under the supervision of licensed engineers are notably free from service requirements and repairs that might not have been required. An installation in a New York theater has operated through four heating seasons without a single service call or a dollar spent for new parts. A large boiler plant in Chicago is fired with burners built in the East, and, for three years there was no point from which service could be given nearer than New York. As a matter of providing an extra safeguard, a spare motor was purchased with the original installation, but it was never used. The attendants and owners were enthusiastic over the operation of this installation.

Omitting summer overhauls, service calls for the last two heating seasons worked out 1.03 per job, concentrated upon the 51% of all installations from which calls were received. About 80% of this service was applied to 15 jobs where the competence of attendants was notoriously below average.

HIGH-CLASS PRE-INSTALLATION ENGINEERING ESSENTIAL

One point should be brought out—that all of these installations were made only after careful study of conditions by experienced engineers representing the manufacturer. As a consequence every job was practically a perfect installation when it first began to function. This is in direct contrast to what might be found in a survey of domestic oil-burner installations, where burners would be found improperly installed, and in defective heating plants. Perhaps this is one reason for the remarkable findings from this survey.

In each case the installations were engineered and put in by engineers and employees of the burner manufacturer, bringing into play a less fallible organization from that available to even the best class of agent or dealer. Each one of these jobs was studied as a separate engineering problem, and the application of the oil-burning equipment represented judgment of men skilled and experienced in this field of endeavor. Undoubtedly the great majority of burners used for this class of service to-day are essentially sound, and, within the limits for which they have been designed to operate, can be so installed as to produce results in line with the group studied in this analysis.

It would appear that an agent, in the accepted sense of the term, would be in hot water in this field, unless his staff included high-class heating engineers and experienced oil-burner men. A "short course" in the factory of the oil-burner manufacturer, such as frequently is provided in the domestic oil-burner industry, would not necessarily qualify for work in the commercial field.

The reason for this is not self-evident from the nature of the engineering involved in the general application of commercial equipment for the systems are simple enough mechanically. Misapplication of the equipment or mistakes in judgment are, however, costly, both in cash and reputation, while the difficulties frequently encountered in adapting a newly installed system to uncertain load and operating conditions demand speedy and expert attention in order to preserve amiable relations with the owner or the architects.

Another point of material difference between this and the domestic oil-burner field is the extent to which instruction is given to the individual or individuals who are to have direct charge of the installations. When a domestic job has been completed, it is seldom that more than an hour is spent in giving instruction or information to the home owner. The manufacturer of an industrial or commercial type burner thinks nothing of having an operating engineer spend a week with the attendant, during which time the education of the latter should progress to such a point that he intelligently can make all of the necessary adjustments, maintain a "clean" fire, and have an accurate idea of the nature of the attention he will have to give to its operation and to the few points requiring mechanical attention. One of the most important items of this instruction is to teach him the difference between real trouble and the phenomena resulting from improper operation. Probably the most significant effect of the prolonged period of instruction is the self-confidence which association with an experienced man imparts to the attendant.

TABLE 1. SERVICE ON COMMERCIAL INSTALLATIONS OF OIL-BURNING EQUIPMENT USED PRIMARILY FOR HEATING

Heating Season	Number of Installations on Charge Service.	Number of Service Calls on These Jobs, Involving Billing.	Number of Charge Service Jobs Going Through Season Without Calls.	Gross Billing for Material	Gross Billing for Labor	Average Gross Service Costs per Job.	Estimated Average Costs of Boiler Brickwork Repairs.
1923-1924	18	15	10	$126	$185	$18.00	$45
1924-1925	25	17	9	204	144	17.40	45
1925-1926	44	20	32	257	301	12.70	45
1926-1927	69	32	48	476	310	11.40	45

HOW BRASS POLISH MINIMIZED OPERATING TROUBLES

The writer, in a long experience in sales engineering in connection with extremely high-class oil engines of the surface-ignition and Diesel types, hit upon a gallon can of brass polish as a most effective "eliminator" of trouble and service calls. The engines, for both marine and stationary work, were built with the precision of a watch, and had many brass, bronze and steel parts, all finished bright, and polished. In selecting an engineer it was found advisable to accept an applicant who produced evidence of diligence rather than a man who claimed to be an "expert."

Selected on this basis, when the engine or engines were uncrated, this embryo engineer was called upon to assist in the installation, during which period he was led to handle and familiarize himself with every part of the frequently intricate mechanism. Practically all of the possible adjustments were made at the factory, and locked, and the engineer was told the functions of each part, the troubles that might come, and the best methods of correcting mal-functioning.

TABLE 2. ANALYSIS OF SERVICE DATA SECURED IN STUDY OF OVER 200 COMMERCIAL OIL-BURNER UNITS.

Individual installations		95
In these installations there are:	pumps	180
	burner units	205
Service calls, total		98
" "	due to incompetent attendance, or free service	68
" "	for motor trouble	12
" "	for water in oil	3
Installations overhauled in summer		16
"	reporting no service, but buying minor parts	14
"	requiring emergency service for shut-downs	6
"	requiring no service during this period	48
"	requiring no service since installation*	20
"	requiring 1 service call during period	16
"	requiring 2 service calls during period	18
"	requiring 3-5 service calls during period	12

NOTES:

The aggregate value of the installations is approximately $361,000.
About 25% of these installations are single boiler, single burner jobs.
Five installations were provided with spare parts other than usually furnished.
This analysis includes only low-pressure heating jobs.

*Some of these burners have been in service for four and five years.

Then, when the engine was ready to start, a big 1-gal. can of brass polish and a bundle of waste were produced and presented to the incumbent and he joined the writer in lovingly removing all evidences of handling during the installation period. When the installation stood forth in all its beauty, the operating trials were begun, and only one injunction was emphasized—always to keep the engine shining, clean, and properly lubricated.

It was interesting to trace the operation of some of these plants—year after year they would produce power without interruption and with no service or repair costs. And exactly the same principle applies to the operation of commercial oil burners, except that they are, for the most part, amazingly simple.

COST OF BOILER BRICKING

The cost of initial bricking and of such maintenance as is required from time to time, properly is a charge against the oil burner, although it is for an element of the boiler itself. However, it would be exactly the same thing as considering the replacement of the lining of a fire pot in a domestic oil burner. As some boilers require no bricking, the cost varies from zero upward.

Taking the general run of boilers found in this investigation it was found that the average annual cost of re-bricking the furnaces was $45 or about $0.35 per boiler H.P. per year.

Again, there were small expenditures in these jobs for motor repairs that did not appear on the books of the burner manufacturer, but resulted from direct contact with motor manufacturers. A'so there were small items for tank gauge repairs. It is unlikely that these average over $1.50 per job per year.

Table 1 was compiled from data covering installations in service during the entire heating season of 1926-7, and prior seasons, while the data in Table 2 included burners in service during only a portion of the last heating season.

Electric Power Interests Urged to Promote Oil Burning

Executives of the leading central electric stations of the east and executives of some of the principal oil-burner manufacturers met in New York, October 10, at the invitation of the McGraw-Hill Company, to discuss the advisability of interesting the central stations in the promotion of oil heating. The result of the meeting was the appointment of a committee which consisted of M. E. Simpson, Electrol Distributing Corporation, chairman; C. U. Williams, Williams Oil-O-Matic Heating Corporation; W. C. McTarnahan, Petroleum Heat and Power Company; Haldeman Finnie, Timken-Detroit Company, and H. F. Tapp, American Oil Burner Association. The committee will operate in conjunction with the General Merchandisinig Committee of the National Electric Light Association which is in charge of C. E. Greenwood of the Edison Electric Illuminating Company of Boston.

Chicago Oil Burner Association Inaugurates Employment Exchange

A new employment service for the oil-burner industry in the Chicago territory, was announced at the monthly luncheon meeting of the Chicago Oil Burner Association, held at the Allerton Club, Chicago, November 8. Over 50 members and guests were in attendance. The service provides for the exchange of information among the members of the association seeking new employees and to keep the members informed with regard to available men.

P. E. Fansler, associate editor of THE HEATING AND VENTILATING MAGAZINE, was the guest speaker. His talk was devoted to a discussion of present-day conditions in the oil-burning industry. Among the other speakers were C. H. Foulds, E. Rees, C. N. Lockwood, T. C. Kyle and J. W. Keith. New members elected were the Byran Boiler Sales Company, J. M. Knox (associate), and the Wayne Company, H. A. Adams (active).

Homer Linn called attention to the meeting of the American Petroleum Institute at the Stevens Hotel, Chicago, December 6-8.

Stag Dinner by Chicago Oil Burner Association

Chicago Oil Burner Association held a stag dinner at the Belden-Stratford Hotel, Chicago, October 28, with 175 members and guests in attendance. R. D. Marshall, of Williams Oil-O-Matic Corporation, was the principal speaker and President Lyle Straight acted as toastmaster.

The Dempsey-Tunney fight and other moving pictures were shown and there were several vaudeville acts. Arrangements were made by a committee composed of J. W. Owens, Cliff W. Presdee, T. L. Owens and Glen C. Sutton.

R. T. Haslam Associated with Standard Oil Development Company

Robert T. Haslam formerly professor of chemical engineering at the Massachusetts Institute of Technology, and in charge of its courses in gas and fuel engineering, resigned from the Institute's faculty, effective November 1, to become a member of the executive staff of the Standard Oil Development Company, 26 Broadway, New York. Professor Haslam is best known in the heating and ventilating industry as the joint author with R. T. Russell of the classic volume, "Fuels and their Combustion," and is a recognized authority in his present field.

For some time past, Professor Haslam has acted as a technical consultant and adviser on research and development projects for the Standard Oil Company of New Jersey and affiliated companies. The demands made upon him by the Standard Oil Company have become so great that conditions are now reversed and Professor Haslam is devoting the major part of his time to the research and development work of this organization and will act in an advisory capacity to M. I. T.

U. S. Chamber of Commerce to Work with Trade Organizations

Recognizing the increasing importance of the extension industrial group effort, the Chamber of Commerce of the United States has created a new department to work with trade organizations. Dr. Hugh P. Baker, an economist, who as head of the American Paper and Pulp Association, has won recognition as one of the country's leading authorities on trade associations has been made head of the department and will assume his duties February 1.

The purpose of this move, as explained by President Pierson, is to co-ordinate the expanding relations of the national chamber with the more than six hundred trade associations in its membership, and to lend assistance to the many other industrial groups now laying out their future program of organization.

"In seeking new and enlarged markets for their members," Mr. Pierson explained, "trade groups are more and more interested as groups in transportation questions; elimination of excess varieties; in standardization; in patents; uniform cost accounting; depreciation and arbitration; trade-marks; collective buying; bonding and insurance.

"On the other hand, in an effort to protect industry from within, and, indeed, the business of the country, trade associations are interested in credits, collections, fraudulent bankruptcy, trade ethics, trade practices, and tariffs and taxation.

"Perhaps most important," President Pierson continued, "will be the promotion of the movement already under way looking toward self-regulation by business groups, which has as its aim the elimination of economic wastes in every form. To that end the department will co-operate with the Federal Trade Commission and other governmental agencies."

Gas Companies Rapidly Lining Up for House-Heating Load

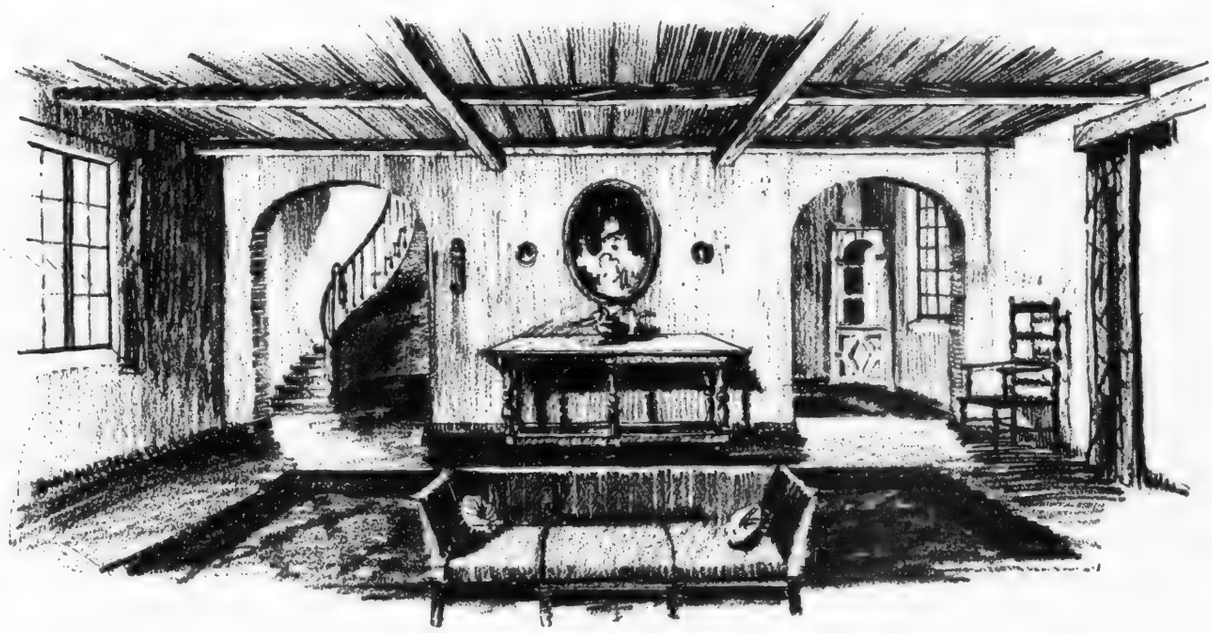
SUMMARY OF GAS COMPANIES PROMOTING SALE OF HOUSE HEATING

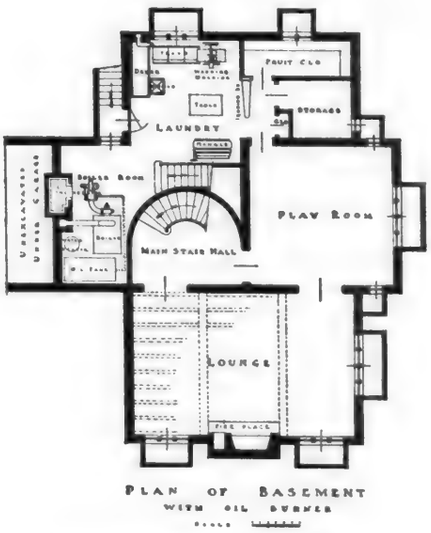
Town	Gas Company	Steam, Hot Water and Vapor	Warm Air	Steam, Hot Water and Vapor Conversions	Warm Air Conversions	Total	Total Consumption in Million cu.ft.
		CALIFORNIA					
Los Angeles	Southern California Gas Co.	550	38,000	200	750	39,500	1,000.
Salinas	Coast Valleys Gas & Electric Co.	2	40	1	2	45	2.
San Francisco	Pacific Gas & Electric Co.	2,000	22,500	Very few	Very few	24,500	4,000.
		COLORADO					
Denver	Public Service Co. of Colorado	85	180	85	None	350	227.
		CONNECTICUT					
Bridgeport	Bridgeport Gas Light Co.	15	1	None	None	16	9.64
Danbury	Danbury & Bethel Gas & Electric Co.	24	2	4	None	30	16.7
Greenwich	Greenwich Gas Co.	15	None	None	None	15	5.
Hartford	Hartford Gas Co.	46	1	None	None	47	10.3
Meriden	Connecticut Light & Power Co.	9	None	1	None	10	3.2
Norwich	City of Norwich Gas & Electric Department	4	None	None	None	4	———
New Haven	New Haven Gas Light Co.	74	19	None	None	93	42.8
New London	Connecticut Power Co.	71	2	None	None	73	24.
Waterbury	The Waterbury Gas Light Co.	2	0	0	0	2	.9
		FLORIDA					
Jacksonville	Jacksonville Gas Co.	43	2	None	None	45	———
		GEORGIA					
Atlanta	Georgia Power Co.	None	1	None	None	1	.103
Waycross	Consumers' Gas & Coke Co.	6	1	None	600	607	.5
		ILLINOIS					
Aurora	Western United Gas & Electric Co.	98	49	None	3	150	———
Belleville	Illinois Power & Light Co.	0	4	0	0	4	1.2
Bloomington	Union Gas & Electric Co.	1	1	0	0	2	———
Carlinville	Illinois Power & Light Corp.	3	1	2	0	6	.120
Centralia	Illinois Power & Light Co.	4	2	3	2	11	17.6
Champaign	Illinois Power & Light Corp.	10	20	0	0	30	9.
Chicago	Peoples Gas Light & Coke Co.	1100	500	1	1	1602	650.
Chicago	Public Service Co. of Northern Illinois	1026	124	3	2	1155	328.
Clinton	Illinois Power & Light Corp.	0	1	0	0	1	.4
Danville	Illinois Power & Light Corp.	11	2	0	0	13	4.5
Decatur	Illinois Power & Light Corp.	13	13	0	0	26	14.5
E. St. Louis	Illinois Power & Light Corp.	8	12	0	0	20	6.5
Edwardsville	Illinois Power & Light Corp.	3	0	0	0	3	.2
Freeport	Freeport Gas Co.	13	7	0	0	20	6.3
Galesburg	Illinois Power & Light Corp.	6	0	0	0	6	2.9
Granite City	Illinois Power & Light Corp.	4	1	0	0	5	1.
Jacksonville	Illinois Power & Light Corp.	1	2	0	0	3	1.
La Salle	Illinois Power & Light Corp.	12	0	0	0	12	5.
Madison	Illinois Power & Light Corp.	1	0	0	0	1	.6
Moline	Peoples Power Co.	2	3	0	0	5	2.4
Peoria	Central Illinois Light Co.	14	20	0	0	34	10.2
Peru	Illinois Power & Light Co.	1	0	0	0	1	.4
Rochelle	Rochelle Gas Co.	1	0	0	0	1	1.
Springfield	Illinois Power Co.	10	4	8	4	26	7.6
Wood River	Illinois Power & Light Corp.	2	0	0	0	2	.5
		INDIANA					
Elkhart	Northern Indiana Public Service Co.	8	5	0	0	13	———
Evansville	So. Indiana Gas & Electric Co.	1	2	0	0	3	1.4
Fort Wayne	Northern Indiana Public Service Co.	29	10	19	0	58	12.
Goshen	Interstate Public Service Co.	1	0	0	0	1	———
Indianapolis	Interstate Public Service Co.	5	2	0	0	7	30.
Muncie	Central Indiana Gas Co.	2	1	0	0	3	1.25
Princeton	Princeton Utilities Co.	1	0	0	0	1	.3
		IOWA					
Ames	Iowa Railway & Light Corp.	1	0	0	0	1	.6
Cedar Rapids	Cedar Rapids Gas Co.	4	3	0	0	7	3.6
Creston	Creston Gas Co.	0	0	1	0	1	.4
Davenport	Peoples Light Co.	3	1	0	0	4	1.9
Des Moines	Des Moines Gas Co.	1	0	0	1	2	1.4
Iowa City	Iowa City Light & Power Co.	3	1	0	0	4	2.6
Le Mars	Le Mars Gas Co.	0	0	0	3	3	.7
		KANSAS					
Atchison	Kansas Public Service Co.	1	0	1	2	4	1.4
		MAINE					
Lewiston	Lewiston Gas Light Co.	2	0	0	0	2	.4
Portland	Portland Gas Light Co.	21	2	0	0	23	7.4
		MARYLAND					
Baltimore	Consolidated Gas Electric Light & Power Co.	1360	82	83	14	1539	615.
		MASSACHUSETTS					
Boston	Boston Consolidated Gas Co.	211	56	3	0	270	112.2
Brockton	Brockton Gas Light Co.	69	1	0	0	70	34.4
E. Braintree	Old Colony Gas Co.	20	1	0	0	21	6.5
Cambridge	Cambridge Gas Light Co.	9	2	0	0	11	5.7
Fall River	Fall River Gas Works Co.	109	13	0	0	122	38.4
Fitchburg	Fitchburg Gas & Electric Co.	12	0	0	0	12	5.9
Haverhill	Haverhill Gas Light Co.	174	17	0	0	191	84.4
Lowell	Lowell Gas Light Co.	54	3	0	0	57	20.4
Lawrence	Lawrence Gas & Electric Co.	18	3	0	0	21	10.8
Malden	Malden & Melrose Gas Light Co.	36	8	28	0	72	15.8
New Bedford	New Bedford Gas & Edison Light Co.	64	9	2	1	76	25.3
Norwood	Norwood Gas Co.	0	0	2	0	2	.6
Pittsfield	Pittsfield Consolidated Gas Co.	6	0	0	0	6	3.
Plymouth	Plymouth Gas Light Co.	3	1	0	0	4	2.
Quincy	Citizens Gas Light Co.	5	1	0	0	6	2.8
Revere	Suburban Gas & Electric Co.	3	1	0	0	4	.8
Springfield	Springfield Gas Light Co.	70	5	0	0	75	53.4
Worcester	Worcester Gas Light Co.	83	19	0	0	102	43.5
		MICHIGAN					
Ann Arbor	Washtenaw Gas Co.	13	13	0	0	26	11.5
Battle Creek	Battle Creek Gas Co.	64	84	0	0	148	57.
Coldwater	Central States Utilities Co.	4	6	0	0	10	4.

SUMMARY OF GAS COMPANIES PROMOTING SALE OF HOUSE HEATING (CONTINUED)

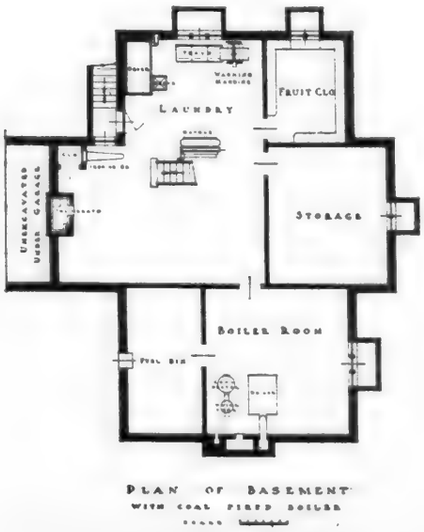
Town	Gas Company	Steam, Hot Water and Vapor	Warm Air	Steam, Hot Water and Vapor Conversions	Warm Air Conversions	Total	Total Consumption in Million cu.ft.
		MICHIGAN—continued					
Grand Rapids	Grand Rapids Gas Light Co.	3	2	0	0	5	1.3
Jackson	Consumers' Power Co.	56	53	1	1	111	39.6
Menominee	Menominee & Marinette Light & Traction Co.	1	3	0	1	5	
Owosso	Michigan Federated Utilities	5	5	0	0	10	3.7
Petoskey	Petoskey Gas Co.	1	0	0	0	1	.2
Plymouth	Michigan Federated Utilities	0	5	0	0	5	1.2
		MISSOURI					
Kansas City	Kansas City Gas Co.	50	400	250	1600	2300	345.
St. Louis	Laclede Gas Light Co.	307	44	3	0	354	190.
Webster Groves	St. Louis County Gas Co.	212	14	0	0	226	110.8
		NEBRASKA					
Grand Island	Central Power Co.	2	2	0	1	5	2.
		NEVADA					
Reno	Truckee River Power Co.	2	4	0	0	6	1.5
		NEW HAMPSHIRE					
Concord	Concord Gas Co.	35	0	0	0	35	10.
Dover	Twin State Gas & Electric Co.	1	1	0	0	2	.6
Manchester	Manchester Gas Co.	19	1	1	0	21	12
Nashua	Public Service Co. of New Hampshire	9	0	0	0	9	2.7
Portsmouth	Portsmouth Gas Co.	3	4	2	0	9	3.1
		NEW JERSEY					
Asbury Park	Jersey Central Power & Light Co.	168	0	110	0	278	60.
Atlantic City	Atlantic City Gas Co.	105	0	2	0	107	40.
Atlantic Highlands	County Gas Co.	6	0	0	0	6	3.
Elizabeth	Elizabethtown Consolidated Gas Co.	14	0	1	0	15	7.
Newark	Public Service Electric & Gas Co.	336	3	4	2	345	146.5
		NEW YORK					
Binghamton	Binghamton Gas Works	10	3	0	0	13	3.6
Brooklyn	Brooklyn Union Gas Co.	272	3	8	2	285	125.8
Brooklyn	Kings County Lighting Co.	54	3	0	2	59	14.
Elmira	Elmira Water Light & Railroad Co.	12	9	1	0	22	4.5
Far Rockaway	Queens Borough Gas & Electric Co.	30	0	15	0	45	12.
Glens Falls	Adirondack Power & Light Corp.	7	0	0	0	7	4.2
Kingston	Central Hudson Gas & Electric Corp.	8	1	8	1	18	1.8
Mechanicville	Halfmoon Light Heat & Power Corp.	1	1	0	0	2	.2
Stapleton	New York & Richmond Gas Co.	5	0	2	0	7	
New York	Consolidated Gas Co. of New York & Affiliated Cos.	521	3	0	0	524	335.
Poughkeepsie	Central Hudson Gas & Electric Corp.	27	2	0	0	29	6.6
Schenectady	Adirondack Power & Light Corp.	76	19	0	0	95	45.
Syracuse	The Syracuse Lighting Co., Inc.	7	7	0	11	25	13.
Tonawanda	Republic Light, Heat & Power Co.	90	10	78	4	182	30.
Utica	Utica Gas & Electric Co.	110	35	1	0	146	81.3
Yonkers	Westchester Lighting Co.	68	0	0	1	69	84.
		OHIO					
Dayton	The Dayton Power & Light Co.	125	100	800	1600	2625	650.
Lima	West Ohio Gas Co.	4	2	0	0	6	
		OREGON					
Portland	Portland Gas & Coke Co.	2084	14,534	22	5	16,645	1,314.
		PENNSYLVANIA					
Ardmore	Philadelphia Suburban Counties Gas & Electric Co.	156	2	0	0	158	83.
Chester	Philadelphia Suburban Counties Gas & Electric Co.	100	6	0	0	106	42.4
Harrisburg	The Harrisburg Gas Co.	11	0	0	0	11	5.3
Johnstown	Pennsylvania Public Service Corporation	6	0	6	0	12	2.3
Lebanon	Lebanon Valley Gas Co.	6	0	0	0	6	1.7
Norristown	Philadelphia Suburban Counties Gas & Electric Co.	175	5	0	0	180	83.
Pittsburgh	Equitable Gas Co.	3,000	6,000	1,500	3,500	14,000	9,000.
Reading	Consumers' Gas Co.	8	1	1	0	10	2.
Scranton	Hyde Park Gas Co.	18	2	0	0	20	9.2
York	Pennsylvania Gas & Electric Co.	16	1	0	0	17	6.
		RHODE ISLAND					
Newport	Newport Gas Light Co.	4	0	0	0	4	
Pawtucket	Pawtucket Gas Co.	156	20	1	0	177	67.7
Providence	Providence Gas Co.	105	22	1	0	128	38.8
Woonsocket	Blackstone Valley Gas & Electric Co.	124	9	1	1	135	54.5
		TENNESSEE					
Knoxville	Knoxville Gas Co.	11	0	0	0	11	6.3
		UTAH					
Salt Lake City	Utah Gas & Coke Co.	62	61	2	0	125	67.8
		VERMONT					
Bennington	Twin State Gas & Electric Co.	9	0	4	5	18	2.4
Rutland	Rutland Railway Light & Power Co.	3	1	0	0	4	.7
		VIRGINIA					
Newport News	Virginia Public Service Co.	4	0	0	0	4	2.
Portsmouth	Portsmouth Gas Co.	5	0	0	0	5	1.5
		WASHINGTON					
Bellingham	Puget Sound Power & Light Co.	4	35	0	0	39	5.
Seattle	Seattle Lighting Co.	26	242	0	2	270	50.
Spokane	Spokane Gas & Fuel Co.	8	12	5	0	25	14.4
Tacoma	Tacoma Gas & Fuel Co.	125	190	1	0	316	30.
		WISCONSIN					
Kenosha	Wisconsin Gas & Electric Co.	1	2	0	1	4	1.4
Madison	Madison Gas & Electric Co.	8	2	5	2	17	5.7
Milwaukee	Milwaukee Gas Light Co.	224	71	0	0	295	116.
Oshkosh	Wisconsin Public Service Corp.	12	2	10	0	24	4.8
Sheboygan	Wisconsin Public Service Corp.	5	8	0	1	14	6.7
		WYOMING					
Cheyenne	Cheyenne Light, Fuel & Power Co.	22	7	120	50	199	59.2
		DISTRICT OF COLUMBIA					
Washington	Washington Gas Light Co.	200	4	0	0	204	45.
		CANADA AND FOREIGN					
Edmonton, Alberta	Northwestern Utilities, Limited	3	0	160	3,044	3,207	777.
Hamilton, Ontario	United Gas & Fuel Co. of Hamilton, Limited	200	150	1,750	150	2,250	250
Montreal, Quebec	Montreal Light, Heat & Power Consolidated	1	0	0	0	1	.8
Ottawa, Ontario	The Ottawa Gas Co.	10	1	9	1	21	5.1
Winnipeg, Manitoba	Winnipeg Electric Co.	26	6	0	0	32	21.4
Totals		17,460	84,002	5,332	11,373	118,167	22,203.4

This tabulation, prepared by the House Heating Committee of the American Gas Association, shows the status of gas residential heating at the end of the last heating season. Nearly 120,000 installations are doing missionary work for the gas interests. Twenty-two million thousands of cubic feet of gas is being burned annually, at a cost of over $15,000,000.





Basement Plan—Burning Oil



Basement Plan—Burning Coal

Fluid Fuel Interests Campaign to Basement

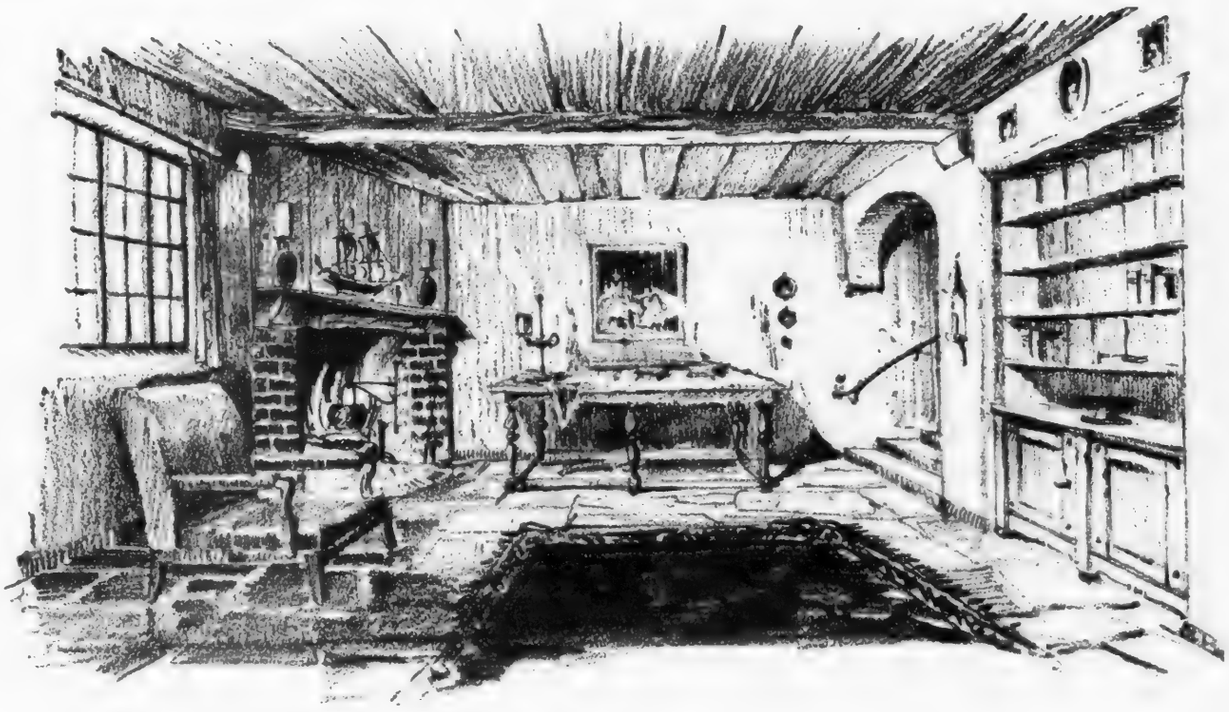
PROPER utilization of what, in the average home, is waste space is the impelling motive in sales talk and literature presented by leading manufacturers of oil burners and gas-fired boilers. Few home-owners think of using their basements except for storage, and seldom does this use justify the large volume of the cellar and its cost.

An outstanding example of effective presentation of this idea is found in a recent publication prepared by Electrol, Inc., St. Louis, designed particularly to tell the Electrol story to architects and builders. The illustrations on these pages are reproduced as used on two facing pages, except that the floor plans were originally printed in blue and white to represent blueprints. To quote the catalog:

"The architect's sketch, above, shows the utilization of space made available by the rearrangement of the basement due to the installation of an oil burner to replace coal. An attractive, well-lighted lounge and playroom were made possible—adding two useful and desirable rooms to the house.

"The blueprint reproductions show the basement plan as it was before the change, and after. If a saving in first cost is desired in the construction of a home, the space used for the lounge and playroom in this case could be left unexcavated.

"The cozy den shown in the other sketch is another example of the possibilities for the better use



in Constructive Utilize Waste Space

of basement space provided by changing to oil from coal as fuel. The same possibilities exist, of course, in planning a new residence, saving the ultimate cost of alterations.

"In this case it has been found possible to make use of the flue for a fireplace in the den, immediately below the fireplace in the first-floor living room. The reproductions show how the basement originally was laid out, and the more advantageous use of space made possible by the installation of an Electrol oil burner."

The identical suggestion can be advanced by those interested in the sale and use of gas-fired boilers and furnaces, and the validity and strength of the argument cannot be disputed. The salesman can represent to the home-owner or builder that the purchase of this class of heating equipment, representing an expenditure of, say, a thousand dollars, will release or make available, as part of the living quarters of the home, that which would cost two or three times as much to build. On this basis the cost of this so-called "luxury equipment" is less than nothing.

It is deplorable that all oil-burner manufacturers do not join in advancing this sound argument with the implied suggestion that many good oil burners are available for this purpose. Undoubtedly it is better policy than using valuable space to present questionable claims of superiority and of performance that, on the face of the statements, are "fishy."

PLAN OF BASEMENT WITH OIL BURNER

Basement Plan—Burning Oil

PLAN OF BASEMENT WITH COAL FIRED BOILER

Basement Plan—Burning Coal

State and Municipal Codes on Garage Heating

Summary of Existing Requirements Compiled By Conference Committee of National Fire Protection Association

IN compiling data for a proposed code for the heating and ventilation of commercial garages, the Conference Committee of the National Fire Protection Association has procured copies of many existing codes or recommendations. For purposes of easy reference, the committee has made a correlation of the requirements of these codes and they are here presented as published in the *Journal* of the A. S. H. & V. E.

SUMMARY OF HEATING REQUIREMENTS

It was found that hot water and steam systems are not prohibited by any of the 14 existing codes or recommendations.

Of the ten codes which have any reference to heating equipment, eight specify that the boilers shall be in a separate room of fire-proof construction, and four of these definitely specify that the entrance to boiler room shall be direct from outdoors only.

Of the ten codes which have any reference to heating equipment, one definitely prohibits hot air furnaces; another prohibits them unless approved by the fire commissioner; another limits them to garages having not over three cars, and if located in a separate room; another permits them only for minor garages (not more than 700 sq. ft. floor area) if approved by fire underwriters and if room is ventilated at floor line; another permits them if open fires do not exist; another permits them if located in a separate fire-proof room with cold air opening from outdoors and with air discharge to garage not less than 6 ft. above floor and provided that air is not recirculated.

Of the ten codes which refer to heating, three definitely prohibit the use of open gas or oil stoves; one prohibits them if exposed; one prohibits them unless separated from garage by fire-proof wall or room; one prohibits them without permission of fire commissioner; one permits them in garages having not over five cars, provided the opening to the flame is covered with a wire gauze having not less than 28 meshes per lineal inch.

SUMMARY OF VENTILATION REQUIREMENTS

Of the ten codes which refer to ventilation, five recommend adequate natural ventilation where possible. One of these specifies open windows or skylights to equal 10% of floor area, and a hose for connecting exhaust pipe of motor to outdoors, while a mechanical system is recommended as an alternative; another requires open windows or skylights equal to 5% of floor area, and a mechanical system as an alternative; two codes specify openings in outside walls and at floor level with ducts connecting to outdoors, and as an alternative a mechanical system is specified; while another requires open windows and skylights for entrance of fresh air, and foul air outlets in side walls at floor line.

Of the ten codes which refer to ventilation, six require that all foul air vent openings shall be in side walls and near

	HEATING			VENTILATION		
City or State	Hot Water and Steam	Hot Air Furnaces	Open Gas and Oil Stoves	Garage Storage	Repair Rooms	Repair Pits
Detroit	Permissible. Where pipes enter from adjoining rooms, vapor proof nipples are required, through floor and for height of 12″. Opening between boiler room and garage to have fire door—air drawn into boiler direct from outdoors. Boiler room may be in basement below floor of garage if floor slab above the boiler is at least 8″ thick and properly reinforced and is gas and moisture proof	Permissible only for minor garages if approved by Fire Underwriters and if room is ventilated at floor line. (A minor garage to have not more than 700 sq. ft. floor area car storage.)	Prohibited.	Rooms to have openings for ventilation of at least 30 sq. in. along at least 2 walls and at floor level. These openings to connect by incombustible flues to outside air and to be provided with 2 × 2 mesh brass screen on inside of wall and unless laid with a downward slant direct to the outside air, shall conduct to and through a sparkless fan, run continuously, of sufficient size to completely change the air volume every ten minutes. Discharge outlets of vent pipes shall be provided with 20 × 20 mesh brass screens.		Not permitted on ground floors unless the bottoms of such depressions are 6″ above grade and vented from two sides to prevent accumulation of vapors heavier than air. Max. depth elevator pits, 36″. The main portion of pit not to exceed 24″ deep. A vent not less than 4″ diam. shall be carried from bottom of pit to outside to provide ventilation through movement of car.
Indiana	All heating to be steam or hot water system. All heating plants must be in rooms by themselves, opening from outdoors only.	Furnaces might be accepted for garages having not more than 3 cars and located in separate rooms.	Prohibited.	No requirements but recommends removal of gases and fumes at floor line.		
Los Angeles	Not mentioned.			All public garages require ventilating openings through all walls and extending to the outside of building. Each opening to be from 40 to 60 sq. in. area and within 2″ of floor and spaced not over 16′ apart in all walls and partitions. Fire Department may approve any system which will provide equivalent ventilation. Storage rooms only permitted below ground level and require constantly operated ventilating systems with at least two air changes per hour. Violation of above is punishable by fine or imprisonment.		
Massachusetts outside City of Boston	Permissible if boilers are in separate fire-proof room having no direct opening to garage. Entrance to such room direct from outdoors.	Not permitted without approval of fire commissioner.	Not permitted without approval of fire commissioner.	No storage of gasoline or handling of same in any portion of building below street level.		Prohibited.
Newark, N. J.	Not mentioned.			Natural ventilation recommended with fresh air to enter open windows and skylights, and foul air outlets to be in side walls at floor line.		

the floor; one code requires vent openings at the floor and connected to ducts extending through the roof to outdoors; another requires vent ducts with openings at floor and ceiling.

One code requires for live storage area 1 1/2 c.f.m. per square foot of floor if air is for displacement, or 15 c.f.m. per square foot if for dilution, and recommends at least 2500 c.f.m. per cubic foot CO within breathing zone. For the repair rooms it requires 3 c.f.m. per square foot of floor if by displacement, and 30 c.f.m. if by dilution. The method of air circulation is not specified.

	HEATING			VENTILATION		
City or State	Hot Water and Steam	Hot Air Furnaces	Open Gas and Oil Stoves	Garage Storage	Repair Rooms	Repair Pits
Baltimore	All heating plants to be in separate room with outside entrance.	All heating plants to be in separate room with outside entrance.	All heating plants to be in separate room with outside entrance.			
Buffalo	No recommendations.	No recommendations.	No recommendations.	Natural ventilation by open windows or skylights to equal 10% of floor area. Where this is insufficient to properly ventilate, a mechanical system will be required. A hose shall be provided for connecting to the exhaust pipe of motor and arranged to discharge the exhaust gases to outdoors.		
Chicago	Sufficient heating facilities shall be installed to permit operation of mechanical system of ventilating, continuously when required.			Natural ventilation if possible by means of windows and skylight, area of which should be equivalent to 10% of floor area and 1/2 open. If impracticable, type of ventilation should be determined for each case by Division of Fire Prevention. Vent at floor line with connections to exhaust fan and employ 12 changes of air per hour on basis of 10′ ceiling height. Where possible to determine maximum number of cars under power at one time, allow 5000 c.f.m. per car under power. Ventilation should be sufficient to prevent more than 2 parts CO per 10,000 parts of air.		
Illinois	Permissible if installed in separate room of fire-proof construction.	Permissible if in separate fire-proof room with cold air opening from outdoors. Discharge to be not less than 6′ above floor. Recirculation prohibited	Prohibited.	Three air changes per hr. recommended. Vent ducts open not over 4″ above floor and through roof.		Permissible if ventilated.
Ohio	Permissible but exposed fires and stoves are prohibited.	Permissible but open fires are prohibited.	No exposed fires or stoves permitted.	Adequate natural ventilation required, otherwise an approved means of exhausting vitiated air is necessary.	System required to supply not less than 60 c.f.m. per 100 sq. ft. floor area. The air to be taken from sanitary location outside of building and above grade. Air to be supplied to room not less than 8 ft. above floor. Vent registers at or near floor line at most effective location and connected to incombustible flues or ducts discharging above roof. Recirculation prohibited. Dir. steam or hot water may be used with fresh air inlets at ceiling and vents at floor with flues to roof or to exhaust fans or accelerating coils to remove not less than 60 c.f.m. per 100 sq. ft. floor area.	
Pittsburgh	Permissible if boilers are in separate fire-proof room having no direct opening to garage. Entrance to such room direct from outdoors.	Prohibited.	Permissible in 5-car garage or smaller only if covered with wire gauze not less than 28 meshes per lineal inch.			Pits are prohibited in new construction.
Trenton	Permissible if boilers and fuel rooms are separated from all other rooms by means of fire-proof construction.			No recommendations.	No recommendations.	No recommendations.
Washington, D. C.	Boiler and fire rooms to be enclosed in 8″ masonry walls and equipped with fire doors.		Not permitted in garage unless separated by fire-proof wall or room.	Reversible type disc fans shall supply fresh air from outdoors. Six air changes required per hour by fans with fresh air inlets near ceiling. Vent ducts 25′ apart with top and bottom vent intakes connecting to exhaust fan.		
Wisconsin				1 1/2 c.f.m. per sq. ft. of live storage area where by displacement; 15 c.f.m. per sq. ft. if by dilution. For accessory storage use 0.75 c.f.m. per sq. ft. area. Maintain at all times at least 2500 c.f.m. per cu. ft. CO, within breathing zone.	3 c.f.m. per sq. ft., if by displacement, or 30 c.f.m. if by dilution.	

Another requires, for storage rooms, six air changes per hour to be supplied by means of reversible type disc fans drawing air from outdoors. This code recommends vent ducts 25 ft. apart, connecting to exhaust fans, and having bottom and top intakes.

Another requires, for repair rooms, 0.6 c.f.m. per square foot floor area, the air to be introduced not less than 8 ft. above floor. Vent registers near floor to connect to ducts extending through roof. These ducts may be used alone or with exhaust fans or accelerating coils, and to be capable of removing 0.6 c.f.m. per square foot of floor.

Another permits only storage rooms below ground level, and requires constantly operated ventilating systems with at least two air changes per hour, violation of which is punishable by fine or imprisonment.

Another recommends, for storage rooms, three air changes per hour.

Another code which recommends a mechanical system only as an alternative, specifies, for storage rooms, vent ducts connecting to a sparkless fan, run continuously, and with capacity to produce six changes of air per hour.

Another code which recommends a mechanical system only as an alternative specifies, for storage room, vent ducts connecting to an exhaust fan with capacity to produce twelve changes of air per hour, on a basis of 10 ft. ceiling height. A further provision is, that where possible to determine maximum number of cars under power at one time, 5000 c.f.m. should be allowed for each car under power, and that ventilation should be sufficient to prevent more than 2 parts CO per 10,000 parts of air.

Consolidation of Minneapolis and Honeywell Companies

W. R. Sweatt

M. C. Honeywell

ANNOUNCEMENT of the merger of the Minneapolis Heat Regulator Company with the Honeywell Heating Specialities Company to form the Minneapolis-Honeywell Regulator Company, which appeared in last month's issue, emphasizes the growth of these two companies, which has been on closely parallel lines.

The first thermostatic regulator was invented by H. M. Butz in 1883-4. This was not an improvement in existing devices but in itself was a revolutionary accomplishment. Before that time automatic heat regulation had been unknown. The Butz patent was acquired by the predecessor of the Minneapolis Heat Regulator Company—the Consolidated Temperature Controlling Company, later the Electric Thermostat Company, and re-organized in 1893 as the Electric Heat Regulator Company. In 1912 the name was changed to the Minneapolis Heat Regulator Company.

There were many obstacles to be met in the introduction of this invention into the homes of the '80's. Not only was it a new and comparatively untried device, but few boilers and furnaces were equipped with lift dampers, and electric wiring in homes was practically unknown. A spring motor which had to be wound periodically was the only motive power for the original heat regulators.

A great deal of effort in time and money had to be spent in bringing about the changes necessary to popularize this new invention.

The directors of the company's fortunes at that time realized that the only hope for success lay in advertising. An educational campaign was begun almost immediately which has been consistently developed throughout the 44 years of its history with the result that to-day automatic heat regulation is considered standard home equipment, and nearly all boilers and furnaces are equipped with lift dampers which permit the application of automatic heat regulation.

In 1889 the Minneapolis Heat Regulator Company acquired the rights and business of the Guion motor which materially stimulated the growth and development of the business.

It was soon after this that W. R. Sweatt, president of the Minneapolis Heat Regulator Company and now chairman of the board of the Minneapolis-Honeywell Regulator Company, became director. In 1892 he took complete charge of the management.

From the beginning, all the company's efforts have been directed simply to the manufacture and sale of heat regulating and thermostatic devices. In addition to devices for house heat control it manufactures devices of similar character for use in industrial work. It also manufactures special controlling devices for oil fired warm-air furnaces, refrigerators, enamelling ovens, dry kilns, power stations, and for many other related purposes.

The Minneapolis company has been a leader in introducing new devices and originated, in addition to the regulator itself, the following auxiliary equipment —the first clock attachment, the first eight-day control clock, the first 110-volt A. C. control motor, the first dual controls, the first thermostatic relay-switch, the Series 10 controls, and the first Protectostat.

HONEYWELL SPECIALIZES IN FLUID FUEL CONTROLS

The Honeywell Heating Specialties Company originally was organized in 1906 and incorporated in 1916 under its present name. This company likewise has been a leader in its own particular field. Whereas the Minneapolis company catered especially to the individual customer and very largely to coal-fired systems, the Honeywell company has developed its contacts principally with the manufacturers of heating equipment and has specialized on controls for oil and gas heating systems. It furnishes equipment to manufacturers of many of the important automatically controlled domestic oil burners, and also supplies controls to many of the largest manufacturers of steam, water, and warm-air heating plants.

Both the Minneapolis company and the Honeywell company have recognized the importance of advertising. The Minneapolis company, in view of its extensive sales at retail to the customer, has made its principal appeal directly to the public, using the most popular magazines and newspapers as its media. In view of the fact that the Honeywell company drew the greater part of its business directly from the manufacturer, it has advertised principally in trade journals, although it has also used the populuar magazines and newspapers.

Through persistent advertising of both companies the names "Minneapolis" and "Honeywell" have become nationally known, and their respective products have become standard.

"The consolidation permits a wider range of products, broader distribution and more extensive service facilities," said Mr. Sweatt. "In manufacturing, operations of a similar type can be concentrated, eliminating duplication of equipment and effort. Important economies also will be possible in marketing and advertising.

"The advertising in general will follow the compelling educational policy which has proved so successful in popularizing automatic heat regulators. With a larger fund under one direction the advertising will be co-ordinated so that the greatest possible advantage will be obtained. It will thus be possible to strengthen and intensify the sphere of educational influence so that the potential and actual market will be greatly extended."

AIR CONDITIONING

Dry-Bulb Temperature of Air Mixtures

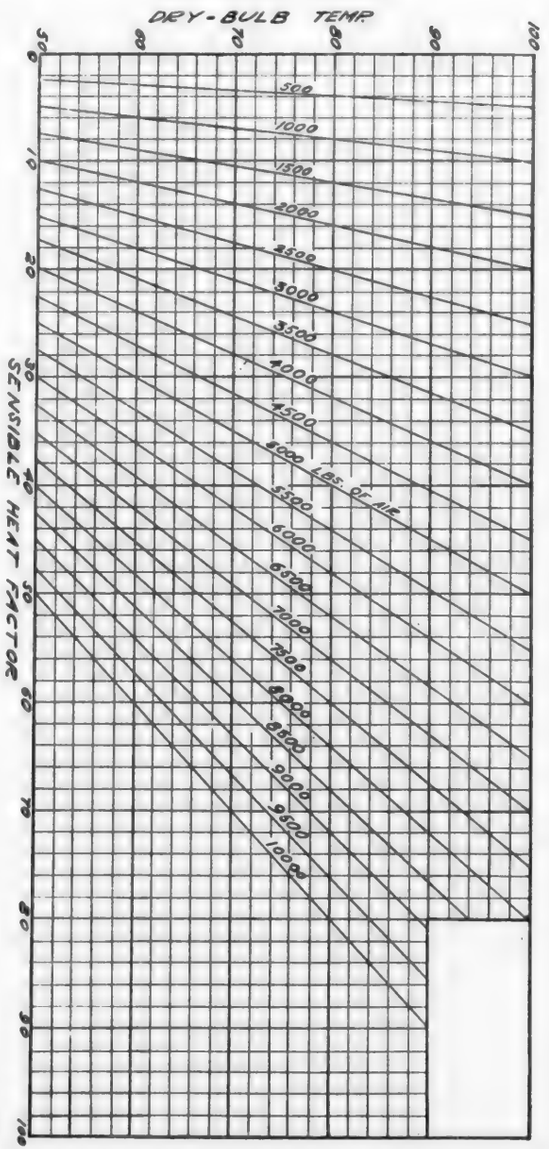
Data Sheet No. 20-J shows the relation between the sensible heat content of air at various dry-bulb temperatures and is used to determine the dry-bulb temperature of a mixture of two or more portions of air at various dry-bulb temperatures.

Example: Assume that properly to cool a theater 5000 lbs., or approximately 66,000 C.F.M., at a temperature of 61° F., are required at the inlet grilles. Also assume that an air-cooler is installed to maintain 3500 lbs. of air at a temperature of 55° F. saturated at the cooler outlet. How much recirculated air at a temperature of 75° F. must be mixed with the cooled air to maintain the required 61° F. at the grilles? First locate 61° on the dry-bulb temperature scale, at the left of the chart, and pass horizontally to the right until the 5000-lb. line (total weight of mixture) is reached. From this point drop vertically downward and read 30.5 as the total sensible heat factor. Similarly, locate 55° on the dry-bulb temperature scale and pass horizontally to the right to the 3500-lb. line and drop vertically downward and read 19.0 as the sensible heat factor produced by the cooler air. Therefore, the difference between 30.5 and 19.0, or a sensible heat factor of 11.5, must be maintained in the recirculated air. Hence, locate 11.5 on the sensible heat factor scale and pass vertically upward to a horizontal line, passing through the 75° dry-bulb temperature line. These two lines intersect on the 1500-lb. line, which is the weight of air that must be recirculated to maintain the mixture at 61° F.

O. W. ARMSPACH

AIR CONDITIONING—How to Use Chart of Dry-Bulb Temperature of Air Mixtures | No. 20-K

AIR CONDITIONING



AIR CONDITIONING—Dry-Bulb Temperature of Air Mixtures | No. 20-J

How Would You Do It?

Question 4

A radiator normally supplied with steam at 2 lbs. gauge pressure and containing 40 sq. ft. of surface is supplied through a pipe of given diameter. The steam pressure is cut down until it has an absolute pressure of 2 lbs. Will the velocity of steam through the same size of supply pipe be increased or diminished, and by what per cent? Be sure to allow for the reduction in radiator efficiency when the steam pressure drops and the temperature of the steam lowers, and assume 240 B.T.U. per square foot as the efficiency under the normal 2 lbs. gauge pressure.

STEAM at 2 lbs. gauge has an absolute pressure of the atmosphere or gauge pressure of 14.7 lbs. plus 2 lbs., which gives an absolute pressure of 16.7 lbs. This absolute pressure may now be compared with the reduced pressure of 2 lbs. *absolute*, as both pressures have been reduced to the same terms, and the problem becomes one of comparing the properties of steam at 16.7 lbs. absolute and 2 lbs. absolute pressures.

Referring to standard steam tables it is found that the temperatures and volumes are as follows:

Steam at 16.7 lbs. absolute:
Temperature.....219° F. (approx.)
Volume..23 cu. ft. per lb. (approx.)
Steam at 2 lbs. absolute:
Temperature.....126° F. (approx.)
Volume..173 cu. ft. per lb. (approx.)

These values are given as approximate to avoid the use of fractions in the calculations.

According to the terms of the problem the radiator contains 40 sq. ft. of surface and for this an average transmission of 240 B.T.U. per square foot per minute will be taken, since this is the average transmission for ordinary radiation with steam at 2 lbs. gauge when set in a room at 70° F. Of course, with a radiator of any given style or number of columns, and of given height, the transmission for that particular radiator may be substituted in place of the assumed figure of 240 B.T.U. per square foot.

With the steam at 2 lbs. gauge (16.7 lbs. absolute) the temperature of the radiator will be approximately 219° F. since this is the temperature of the steam at this pressure, as has already been determined. And, with the air temperature in the room of 70° F., it can be shown that the temperature difference between the radiator and the room is

219° — 70°, or 149° F.

Now, if the transmission of the radiator is 240 B.T.U. with a temperature difference of 149°, it is possible to compute the number of B.T.U. radiated per degree of temperature difference by dividing the transmission of 240 B.T.U. by the temperature differences existing when this transmission is obtained. thus:

240 B.T.U. / 149, or 1.61 B.T.U.

From this it is fair to assume that with a lesser temperature difference between the room and the radiator the transmission at any other difference may be found, at least approximately, by multiplying whatever difference exists by the transmission at 1° of temperature difference. Under the pressure of 2 lbs. absolute, the temperature in the radiator will be about 126° F., since this is the temperature of the steam under this pressure, and the *temperature difference* will be

126° — 70°, or 56° F.

Therefore the transmission of the radiator under this condition will be

56 × 1.61 B.T.U., or 90.16 B.T.U.

It is now possible to calculate the number of B.T.U. emitted by the 40-sq. ft. radiator under the two conditions of steam pressure, assuming the radiator to be set in a room at 70° F. in both cases. This may be done simply by multiplying the transmission per square foot, in each case, by the number of square feet in the radiator, thus:

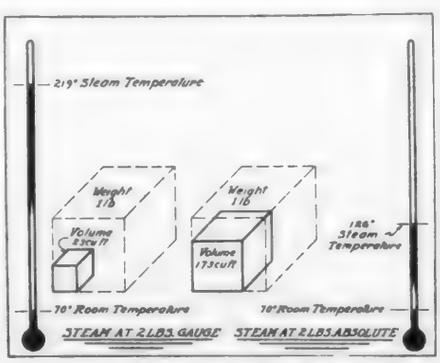
For the radiator with 2 lbs. gauge pressure,

240 B.T.U. × 40, or 9600 B.T.U.

and, for the radiator at 2 lbs. absolute pressure,

90 B.T.U. × 40, or 3600 B.T.U.

Having ascertained the number of B.T.U. which will be emitted by the radiator under the two conditions of steam pressure it now remains to develop the number of pounds of steam which will be condensed by the radiator and to change this amount into cubic feet in order to obtain the volume of steam which will be used in the radiator. Referring again to the steam tables it is found that the *latent heat per pound* in steam at 2 lbs. gauge is about 965 B.T.U., while, at 2 lbs. absolute, it is about 1021 B.T.U. In other words, 1 lb. of steam contains more latent heat when under a high vacuum than when under a slight pressure above the atmosphere; of course, the volume, however, is greatly increased so that the number of *B.T.U. per cubic foot* is much less under the high vacuum.



Problem Presented in Question 4

The number of pounds of steam which will be condensed in the radiator under the conditions of 2 lbs. pressure (gauge) will be the total heat emission divided by the latent heat per pound or

9600 B.T.U. / 965, or 9.94 lbs.

and, since there are 23 cu. ft. to a pound of steam at 2 lbs. gauge, the *volume of steam* will be

23 cu. ft. × 9.94, or 228.62 cu. ft.

When the steam pressure is reduced to 2 lbs. absolute there is a great increase in the volume; in fact, the *volume of steam* at this pressure is 173 cu. ft. per pound so that the radiator will condense a *volume* at the lower pressure of

173 cu. ft. × number of pounds condensed,

but the number of pounds condensed will be much less *owing to the lesser temperature of the radiator and its corresponding loss in heat transmission.*

Knowing that the heat emission under the 2-lb. absolute condition is 3600 B.T.U. and ascertaining that the latent heat in a pound of steam at this pressure is 1021 B.T.U., it is easy to proceed as in the previous case to get the number of pounds condensed, which will be

3600 B.T.U./1021, or 3.52 lbs.;

but, as the volume is so much greater per pound, it is necessary to multiply by the volume per pound to obtain the total volume condensed in the radiator, this being

173 × 3.52, or 608.96 cu. ft.

Now, the previous volume was practically 230 cu. ft., whereas this second value is almost 609 cu. ft. As the question asked in the problem is, "Will the velocity of the steam be increased or diminished and by what per cent?", it can now be answered that the velocity, with the same size of supply pipe, will be increased, as the volume, under 2 lbs. absolute pressure, is much greater than under 2 lbs. gauge, *even taking into consideration the reduction in the radiator efficiency.*

To obtain the percentage of increase in velocity it is only necessary to obtain the percentage of increase in the volume since both volumes pass through the same pipe area. The actual increase in volume is

609 cu. ft. — 229 cu. ft., or 380 cu. ft.

and to get this in terms of percentage the original amount must be divided into the increase and the result multiplied by 100 or

380/229 equals 1.66, and 1.66 × 100 is 166%.

As the original velocity is 100% then the second velocity will be

100% plus 166%, or 266% of the first velocity.

This may be proven to one's satisfaction by multiplying the original volume of 229 cu. ft. by 261% and finding that the result checks out just a little over 600, whereas the figure actually is 609.

PROBLEM FOR NEXT MONTH

Question No. 5

A swimming pool contains 20,000 gal. of water and it is desired to change the water once a week and heat the fresh water up to 70° F., in a period of 12 hours. Assuming that there is no appreciable heat loss from the pool while it is being heated and that the water never comes into the pool at less than 45° F., how much boiler capacity (horsepower) would be required, and what would be the simplest method of applying the heat?

National Radiator Absorbs Pacific Steel Boilers

The National Radiator Corp., Johnstown, Pa., it is announced, has completed plans for taking over the Pacific Steel Boilers Corp., of Waukegan, Ill., and Bristol, Pa., on the basis of $17 a share. National Radiator Corporation was organized three months ago. It is made up of the National Radiator Company, Niagara Radiator and Boiler Company, Continental Heater Corporation, Utica Heater Company, Union Radiator Company and Gurney Heater Manufacturing Company. In connection with the merger, the National Radiator Corporation, which is capitalized at $26,000,000, has sold $12,000,000 of 6½% debentures and 60,000 shares of $7 cumulative preferred stock and retains 270,000 no par common shares.

The Pacific Steel Boilers Corporation had outstanding 160,504 out of a total authorized issue of 300,000 no par common shares. They were sold in January, 1926, at $12.50 a share. The company has $204,200 of ten-year first sinking fund 7% bonds outstanding.

A. S. H. & V. E. Riser Capacity Chart and Tables

Due to a regrettable oversight in the publication, in last month's issue, of the chart and table giving the critical velocities for one and two-pipe steam risers, as developed by the A. S. H. & V. E. Research Laboratory, copyright notices under the chart and tables were omitted. In each case, it should have been stated that this material is copyrighted by the American Society of Heating and Ventilating Engineers, and was published with the society's permission.

Large Shipbuilding Company to Manufacture Heat-Transfer Equipment

The Staten Island Shipbuilding Company, which for more than a quarter of a century has been one of the largest and most active builders of commercial ships on the Atlantic Coast, has formed a division for the manufacture of heat-transfer apparatus. These products are not a new line with the company, as this type of equipment has been manufactured at the plant for more than thirty years.

Included in the company's line are: water-storage heaters, feed-water heaters, bleeder heaters, waste-heat extractors,

George T. Jacocks
President and General Manager
Heat Transfer Products, Inc.

preheaters, condensers, evaporators, time coolers, oil heaters, oil coolers, humidifiers, dehumidifiers, superheaters, desuperheaters, boilers, tanks, piping, including bends of all materials, pumps, fabricated plate ware, and galvanized products.

The plant is exceptionally complete, with well-organized and maintained shops to produce either plate work, castings, machine work, boiler work, forge work or welded products.

In the personnel of Heat Transfer Products, Inc., are men widely known for their achievements in the industry. The chairman of the board is William J. Davidson, who is president of the Staten Island Shipbuilding Company, also president of the Staten Island National Bank & Trust Company.

George T. Jacocks, former vice-president and works manager of the Whitlock Coil Pipe Co., of Hartford, Conn., has been elected president and general manager. His achievements in this character of products is well known to the industry.

Sylvan J. Crooker, who for many years has been connected with the United States Bureau of Standards and United States Bureau of Mines, also as chief engineer for the Whitlock Coil Pipe Company, has been elected vice-president in charge of engineering.

Walter S. Ogilvy, has been elected vice-president in charge of manufacture, also as secretary of the company. Mr. Ogilvy was formerly superintendent of the Beach Division of the Whitlock Coil Pipe Comany.

George H. Bates, the present treasurer and general manager of the Staten Island Shipbuilding Company, will serve as treasurer for the new company.

With the resources and manufacturing facilities controlled by the parent company, Heat Transfer Products, Inc., is equipped to manufacture every type of apparatus used for the production, storage and control of heat and refrigeration.

The main plant of the company is located at Mariners Harbor, Staten Island, New York, where engineering data and estimates are available on any of the company's line of heat-transfer products. The New York address is Room 509, 90 West Street New York.

American Radiator Absorbs American Blower

Announcement is made by the American Radiator Company that, following negotiations now pending, it will acquire the American Blower Co., Detroit, Mich., for over 40 years a leading manufacturer of fans, blowers and other heating and ventilating equipment. The American Radiator Company will take over substantially all of the property and assets of the American Blower Company. The organization of the American Blower Company, however, will remain intact and its business will be carried on by a new company to be known as the American Blower Corporation.

Common stock of the American Radiator Company to the extent of about $4,000,000, will be issued in exchange for the stock of the American Blower Company.

Heating and Ventilating Salesmen's Club of Los Angeles

Organization for the ensuing year has been completed by the directors of the Heating and Ventilating Salesmen's Club of Los Angeles, through the appointment of twelve chairmen with as many committees, as follows:

Boilers, A. W. Merrill; vacuum specialties and radiator valves, E. A. Simons; steam power specialties, English-Lauer; fans and blowers, C. S. Anderson; oil burners, J. A. Gassman; furnaces, water and oil storage tanks, Lee Updegraff; pumps and compressors, Harrold Burbridge; gas boilers, burners and equipment, Ben B. Wood; steam coil storage and tank heaters and garbage burners, John W. Crawford; insulation and pipe covering, L. A. Brinker; automatic temperature control, A. W. Powell; heat cabinets, English-Lauer.

Correspondence

"Responsivity" in Heating Calculations

EDITOR HEATING AND VENTILATING MAGAZINE:

In the article in your August issue on "Responsivity" as a factor in heating calculations, I wish to call your attention to the exponents in the denominators of two equations on page 57, which I believe should be the second power instead of the third power.

In the calculation on page 61, the radiation is based on the maximum requirements of wall, glass and roof. As only one of the assumed maximum weather conditions can occur at one time. it appears that the method used would result in an overplus of radiation. Don't you think that the weather condition assumed for the construction having the greatest importance in regard to heat demand (in this case the roof) should be used for the wall and glass as well?

Portland, Ore. L. K.

REPLY BY MR. WOLFSFELD

It will be found that for a single homogeneous slab, the quantity "t", the thickness of the slab, appears in both numerator and denominator, in which case $ct_1 \div t_1^3$, would reduce to $c \div t_1^2$. The formulae having the third power as the exponent of the denominator is general and correct as printed.

In the second question, our correspondent stresses a very interesting point. As he infers, three different weather conditions cannot prevail at the same time. He therefore suggests that the particular weather condition which causes the greatest heat demand be applied to all exposed surfaces. I think he will find that if the weather conditions assumed for the roof, be applied to all surfaces as he suggests, the resulting radiation will be greater than that given in the table on page 61, whereas our correspondent expects to obtain less radiation by this method. (By the way, the figure for the total radiation given as 164.75 sq. ft. should be 168.35 sq. ft.)

To figure any one weather condition for all surfaces in the ordinary way is to assume that the responsivities of all forms of construction are identical, which is not so. When he assumes the effective temperature of — 15 degrees for the wall, he is assuming that this condition obtains for the entire responsivity time for the wall, namely 3.07 hours.

According to the assumption on top of page 60, this condition does not prevail for more than one hour. In one hour, the effect of the outside weather condition would have penetrated for a depth of only $(1 \div 3.07)^{\frac{1}{2}} \times 13$ or 7.41 inches. Since the effective temperature after this hour would rise, it would not be proper to calculate this wall on a basis of a higher effective temperature difference for the period following the wind of one hour duration than would obtain during the assumed winds of two or three hours' duration.

Our correspondent may investigate a number of other combinations, as this method affords many possibilities. He may assume, for instance, that the one-hour wind may be followed by the two-hour wind, which combination would be more severe than the one wind of three hours' duration. The calculation of heat loss for such combinations is somewhat complicated.

Greasy Core Sand in Radiators

EDITOR HEATING AND VENTILATING MAGAZINE:—

I note in your September issue, Page 102, an article by J. F. B., Brooklyn, N. Y., on "Greasy Core Sand in Radiators," and after reading this article, believe that he could be enlightened considerably, in respect to the amount of core sand remaining in the radiators, by taking a self-conducted tour through some radiator plant. It would not make much difference which plant he visited, as they all use practically the same process; he could then get a very good idea as to the amount of core sand left in the radiators after they are assembled, and also the amount of oil retained by the burnt core sand.

It is the writer's opinion that 80% of the so-called greasy boilers is caused, not by the amount of oil in the core sand in the boilers and radiators, as in the oil used in the manufacture of the pipe, and the oil and dope used on the pipe and fittings in the erection of the heating system.

R.C.B.

Editor's Note: Greasy Core Sand was the subject of an item in THE HEATING AND VENTILATING MAGAZINE for November, 1924, Page 69, and June, 1927, Page 100.

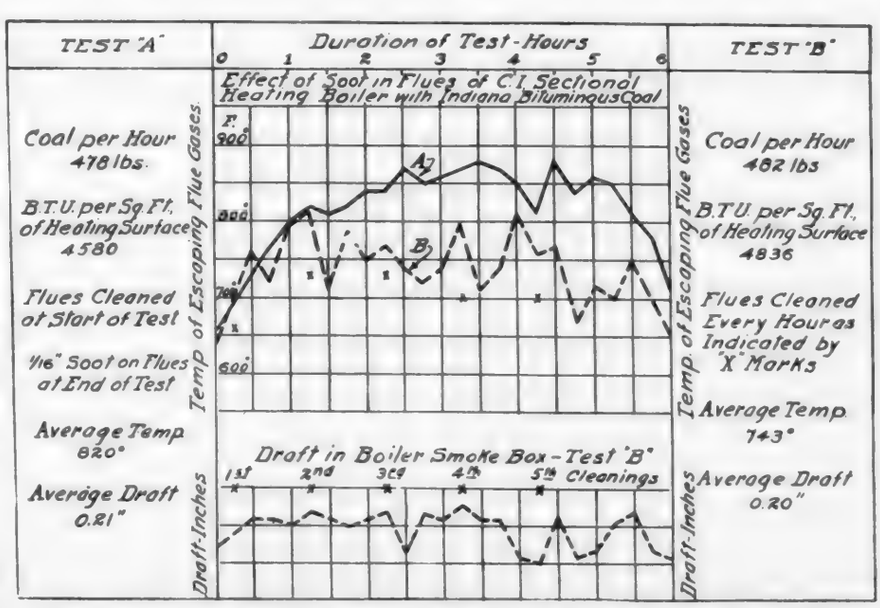
Effect of Soot in Flues of Heating Boilers

EDITOR HEATING AND VENTILATING MAGAZINE:

In THE HEATING AND VENTILATING MAGAZINE for July, 1927, you published a question and answer relative to the heat loss due to soot.

The chart and data on the inclosed print may be of interest as it gives the records of two boiler tests: *Test A* was made starting with flues cleaned and ending with 1/16 in. of soot on flues measured at the mid-point between the flue outlet to smoke-box and the combustion chamber; *Test B* was run to determine the effect of frequent flue cleaning. Conditions were kept as uniform as possible.

The boiler was a large cast-iron sectional heating boiler tested with a very good Indiana bituminous coal. The boiler was cleaned with a steel flue brush made to fit the flue, using one


TEST 'A'
Duration of Test - Hours
0 1 2 3 4 5 6
TEST 'B'
Effect of Soot in Flues of C.I. Sectional Heating Boiler with Indiana Bituminous Coal
Coal per Hour 478 lbs.
B.T.U. per Sq. Ft. of Heating Surface 4580
Flues Cleaned at Start of Test
1/16" Soot on Flues at End of Test
Average Temp 820°
Average Draft 0.21"
Temp. of Escaping Flue Gases
Draft-Inches
A
B
Draft in Boiler Smoke Box - Test 'B'
1st 2nd 3rd 4th 5th Cleanings
Coal per Hour 482 lbs
B.T.U. per Sq. Ft. of Heating Surface 4836
Flues Cleaned Every Hour as Indicated by 'X' Marks
Average Temp 743°
Average Draft 0.20"

Effect of Soot in Flues as Shown by Two Boiler Tests

pass the full length and back for each cleaning.

The difference in heat absorption per square foot of heating surface between "A" and "B," allowing for difference in coal burned, is approximately 5%.

Draft readings are given for Test "B" because the intensity of draft affected the flue-gas temperature after the first and fifth cleaning, causing the temperature to rise after cleaning and to drop later. Otherwise the line "B" shows a decided drop after each cleaning.

It is evident that the heat losses due to soot may reach large proportions and that the frequent careful cleaning of boiler flues is most necessary with soft coal.

Terre Haute, Ind. J. A. CUSHMAN

The "Used" Home and National Prosperity

THE "used" home is becoming quite a problem which some responsible persons believe may, in the near future, become as much of a problem as the used automobile has been in the transportation field, assuming, of course, that the building industry would like to continue its present high status of activity. This is a new and perhaps extreme viewpoint which only recently has begun to appear in the building field.

It is surprising, even astounding, that such a situation is developing at a time when the country as a whole was never more prosperous.

The cash income in the hands of consumers is much greater than we ever expected to enjoy. There has been an unbelievably large increase in the national revenue. There are sufficient funds available in the hands of the building and loan association banks and financing companies to finance a far greater building program than has ever been undertaken at any time.

There is no reason why building operations as a whole, and especially the detached dwelling field, should not be proceeding at a far greater pace than ever before.

Yet all of us know that there are many millions of families living in very undesirable, obsolete or inadequate, uncomfortable, and even unhealthful or unsafe conditions.

I will not attempt a statistical analysis of the national housing situation. Were I to do so it would be necessary to admit that the sum total of information is meager; that very little is known regarding the housing conditions of our twenty-four millions of people or of the economics of the housing situation. Much research and economic study are needed in this field and would be very valuable.

We do know that recent rapid advances in architectural styles, health, social, and other standards have been so marked that homes built only a short time ago are now obsolete and not satisfactory to the average housewife.

We know that in almost every town and city there are a very large number of these houses so well located and well-conditioned that they will be utilized for years. Their number is so large that their occupants constitute the backbone of the market for most of the more expensive commodities. Out of this group is recruited each year a very large proportion of the new home buyers.

Most of these homes also could represent a substantial advance in living and social standards for younger families provided, of course, they were made acceptably modern.

You will remember back in the war period that there was a shortage of both materials and labor available for housing. Later there was such a scarcity of housing and general types of construction that this labor and material was available generally only for new construction. Every jack-of-all-trades became a contractor or dealer of some type, with the result that during this period and also during the war period many dealers, architects, contractors and others discouraged the remodeling and repairing of older properties. In many towns and cities this unfortunate attitude may still exist.

Perhaps one-half to two-thirds of all the homes in the cities, including a large proportion of the apartment dwellings, the well-conditioned, well-located, but not quite modern homes have a market for your materials. The newest, most modern homes, and the poorest located, worst-conditioned and most obsolete of the older properties are not included in this group.

The building and loan associations are planning to push this type of building very aggressively. There are progressive building and loan associations in each of your towns. They will be glad to talk with you; so will others in your home town building circles.

The heating and plumbing industry knows that a large part of its future sales volume must be obtained from existing homes. The paint industry is largely concerned with existing dwellings. The electrical industry knows that only a very small percentage of the homes have modern lighting fixtures and electrical outlets. The fire chiefs, fire insurance companies and underwriters know that the wiring is unsafe in a high percentage of the homes now having electrical facilities.

Nearly every group in the building field is hungry for business and you will find ready co-operators among all of them. Among those who will prove valuable are:

1. The building material commodity groups, individual manufacturers, the trade organizations in the building field. In some instances this includes jobbers.

2. The building and loan associations, banks, finance corporations, personal loan banks. Also, investment banks, specializing in mortgage securities.

3. The national fire insurance companies, the local fire insurance agencies, and local underwriters.

4. Local chapters of architects.

5. Civic organizations, chambers of commerce, service organizations, such as rotary clubs, etc.

6. Local federations of women's clubs, because of the interest taken by the national federation in home improvement.

7. Most of the realtors, particularly those specializing in rented properties, or dealing in older properties. The realtor, as the agent of the property owner, is in an advantageous place to suggest remodeling or rehabilitation to stimulate sale or rental.

8. Local civic board governmental group, including fire chiefs, health officers, housing commissions, etc.

9. Local newspapers.

Various other groups will occur.

There are many salient points that can be used in selling both present and prospective home owners. A few of them are:

A more attractive exterior.

A modern and attractive interior arrangement.

Greater living comforts.

Easier heated in the winter, cooler in summer.

The acquirement of modern equipment (bathroom, laundry, kitchen).

Greater resale value.

Insurance protecting the family in the event of death and consequent forced sale of the property.

—George E. Piper, of The Household Magazine, before the Builders Supply Association.

New Steam Heating Plant for Rochester Gas and Electric Corporation

A new steam heating plant will shortly be completed on Mount Read Boulevard, Rochester, primarily for the purpose of furnishing steam for the General Railway Signal Company's plant and office buildings. This is one of two new enterprises of the Rochester Gas and Electric Corporation, representing an expenditure of nearly two millions of dollars.

Thanksgiving Turkey Causes Maximum Gas Send-Out

An interesting bit of information, coupling the landing of the Pilgrims and the indulgence of non-Pilgrim residents of Chicago, is gleaned from a technical report of a sub-committee of the American Gas Association, having to do with the maximum allowable increase in gas send-out for house heating.

After stating that, in January, 1927, there were 5200 house-heating customers in the Windy City, the report continues:

"A great many distribution systems have the hour of maximum demand occur on a day when there is no house-heating load, such as Thanksgiving. During the cold weather when there is some house heating, as on the maximum day, it is often noted that the maximum hour is considerably less than that of Thanksgiving. It is a natural deduction to suppose that the additional capacity available due to the smaller demand placed upon the system could be applied to a house-heating load without any additional investment to the distribution system or any additional pumping equipment at the production station.

"To make this point clear, in Chicago we have a maximum hour at Thanksgiving of approximately 13,300,000 cu. ft., whereas on the days in cold weather when our send-out reaches a maximum, our maximum hour totals only 11,300,000 cu.ft. It would be natural to conclude that during these cold-weather periods an additional 2,000,000 cu.ft. of gas could be sold for gas house heating, which would amount to 17% of our maximum hour and probably, if spread through the 24 hours, mean a 50% increase in gas send-out. This doubtless would be true were the gas house-heating load to be evenly spread over the entire area and no concentration permitted upon the distribution system.

"It is found at present, however, that gas house-heating customers with the present gas rates for house heating are not evenly spread over the entire area of the city, and without discrimination between customers it would be impossible to so locate gas house-heating load without concentrating heavy demands in certain sections. The better residence neighborhoods will take readily to house heating and the older, poorer areas cannot be induced to use gas as generally as their richer neighbors on account of the cost."

Unusual Applications of Gas Heating

That gas can be utilized to provide heat under almost any condition is evidenced by recent application in unusual places. An exceptionally fine installation was made at the stadium at the University of Michigan, Ann Arbor, for heating the team rooms for the Michigan team and for visiting teams. Naturally, in such a stadium, the quarters provided for athletes are quite elaborate, with dressing rooms, rubbing rooms, shower baths, clothes-drying rooms and an emergency hospital. A separate boiler is installed for each of these two groups, furnishing steam for radiators, for water heating, and the necessary heat for drying purposes. These units operate under thermostatic control and are said to perform their functions with a high degree of satisfaction.

Another interesting application of gas is for the heating of a lunch car in Boston. A small sump, or pit, was built underneath the car and in it was installed a gas-fired boiler which furnishes all the hot water required and heats the car in winter. Gas also is employed for cooking. Indicative of the enormous amount of heat required for such a car, with its large glass area and tremendous infiltration due to frequent opening of the doors, is the fact that the boiler installed is of the size ordinarily used in a six-room house.

Another unusual use of gas for heating was developed in the Chicago and Eastern Illinois Railroad yards at Danville, Ill., where a Pullman car is held over every night from 9:00 until 11:10. During this period, it is not attached to a train and provision must be made to heat it. A gas-fired boiler was installed in the basement of the railroad station and it is only necessary for an attendant to open and close the valve in the gas supply-line. Water from the city line automatically enters the boiler as required. A steam-pressure regulator controls the gas in the burners in such a way as to maintain a constant pressure in the lines of the cars. The steam as generated by the boiler is conducted through an insulated line under the station platform and the tracks to a steam stub, located near the tracks, where the Pullman car stands during the lay-over. The system as installed has sufficient capacity to take care of three cars in the coldest winter weather.

Purdue Gets Fund for Gas Engineering Research

The establishment of a chair for a research professor in gas engineering at Purdue University has been made possible through a fund of $50,000 received from the Indiana Gas Association for this purpose, and to set up graduate and under-graduate courses in gas engineering. Research will be directed along lines of greatest interest to local gas companies. In particular, the first problems to be taken up are: A study of the complete gasification process; use of Indiana coal in the manufacture of gas; the securing of the most practical B.T.U. content in manufactured gas. It is expected that an elaborate laboratory equipment will be developed in the prosecution of this research.

British Heating Engineers Hold Autumn Meeting

S. Booth Horrocks was nominated for president of the (British) Institution of Heating and Ventilating Engineers, at a special autumn meeting of the institution, held October 11 at Caxton Hall, Westminster, London. He will succeed President J. L. Musgrave. Among the officers renominated is W. Nelson Haden, honorary treasurer. Mr. Haden attended the Washington meeting of the A.S.H. & V.E. three years ago and also made an extensive tour through the country in connection with a study of heating and ventilating progress in the United States.

The principal paper of the meeting was one on "Atmospheric Pollution" by Dr. J. S. Owens, a well-known authority on the subject.

In connection with the Associate Members' and Graduates' Section being organized by the institution, it was stated that branches are being formed in various districts as educational centers, starting with London and Manchester.

Oil Fuel Apparently Affecting Anthracite Miners

Reports from the anthracite section of Pennsylvania indicate that the hard coal interests, particularly those engaged in the mining of anthracite, are greatly perturbed because of the tremendous slump in the industry. Church services were held, at which hundreds of clergymen, representing all religious faiths, offered prayers from their pulpits.

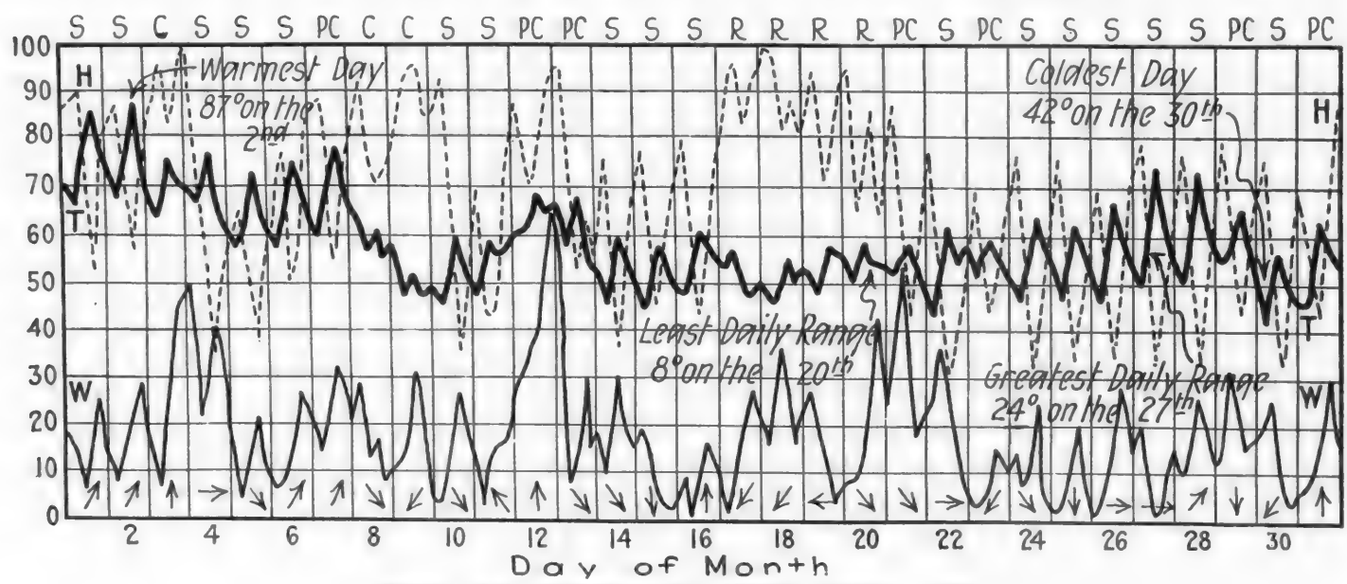
"Anthracite Sunday" was a forerunner of the three-day Anthracite Cooperative Congress, which opened at Mount Carmel, Wednesday, November 9 with addresses by Secretary Hoover on "The Public and Anthracite." Governor Fisher of Pennsylvania on "The Value of the Anthracite Industry to the Commonwealth of Pennsylvania," John L. Lewis, president of the United Mine Workers of America, and Samuel D. Warriner, president of the Anthracite Operators' Conference.

Col. Charles B. Staats, president of the New York State Coal Merchants' Association; Joseph M. Lonergan, sanitary expert from the New York City Health Department; Mayor William Hale Thompson of Chicago, and Thomas Kennedy, secretary of the United Mine Workers of America, were among nearly thirty speakers listed for the Thursday and Friday sessions.

Reports were made in many churches by members of special committees of mine workers and operators, who have been studying the situation, in an endeavor to seek relief. It was reported that the increasing use of oil as fuel has had much to do with the decreased sale of anthracite, as reflected in shipments from the mines. Hope was held out to the miners that oil would increase in price and thus assist in bringing the the anthracite industry back to normal.

The Weather for October, 1927

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	87	89	89	83	86
Date of highest temperature	2	1	2	27	6
Lowest temperature, degrees F.	42	36	36	40	40
Date of lowest temperature	30	30	17	19	18
Greatest daily range, degrees F.	24	33	37	28	31
Date of greatest daily range	27	28	26	27	22
Least daily range, degrees F.	8	7	6	4	7
Date of least daily range	20	27	18	13	1
Mean temperature for month, degrees F.	58.7	57.8	57.5	58.0	62.8
Normal mean temp. for month, degrees F.	56.3	55.4	55.6	54.0	58.8
Total rainfall, inches	8.82	2.82	4.09	1.77	4.65
Total snowfall, inches	None	0	0	0	0
Normal precipitation, this month, inches	3.71	2.91	2.36	2.55	2.41
Total wind movement, miles	12261	7173	7358	8048	6792
Average hourly wind velocity, miles	16.5	9.6	9.9	10.8	9.1
Prevailing direction of wind	N.W.	S.W.	W.	S.W.	S.W.
Number of clear days	16	16	15	16	20
Number of partly cloudy days	8	11	7	4	6
Number of cloudy days	7	4	9	11	5
Number of days on which rain fell	10	8	8	8	6
Number of days with snow	None	0	0	0	5
Snow on ground at end of month, inches	None	0	0	None	0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Warmest Day 87° on the 2nd
Coldest Day 42° on the 30th
Least Daily Range 8° on the 20th
Greatest Daily Range 24° on the 27th
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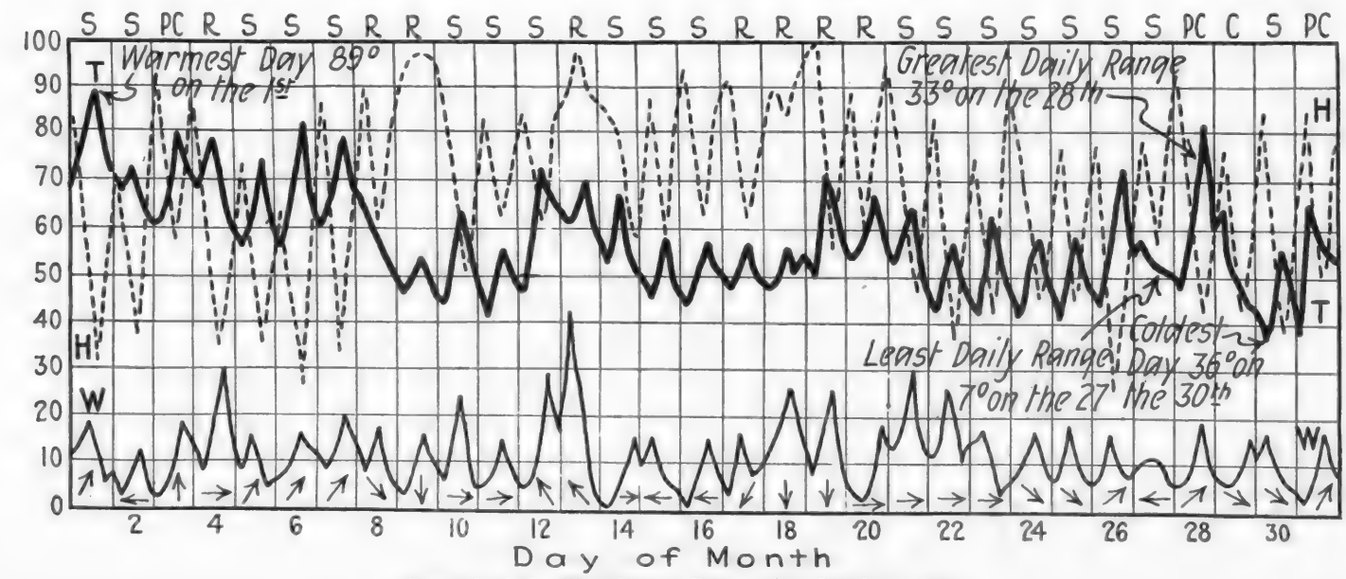
Day of Month

Record of the Weather in New York for October, 1927
(Hourly Observations of the Relative Humidity Plotted on this Chart)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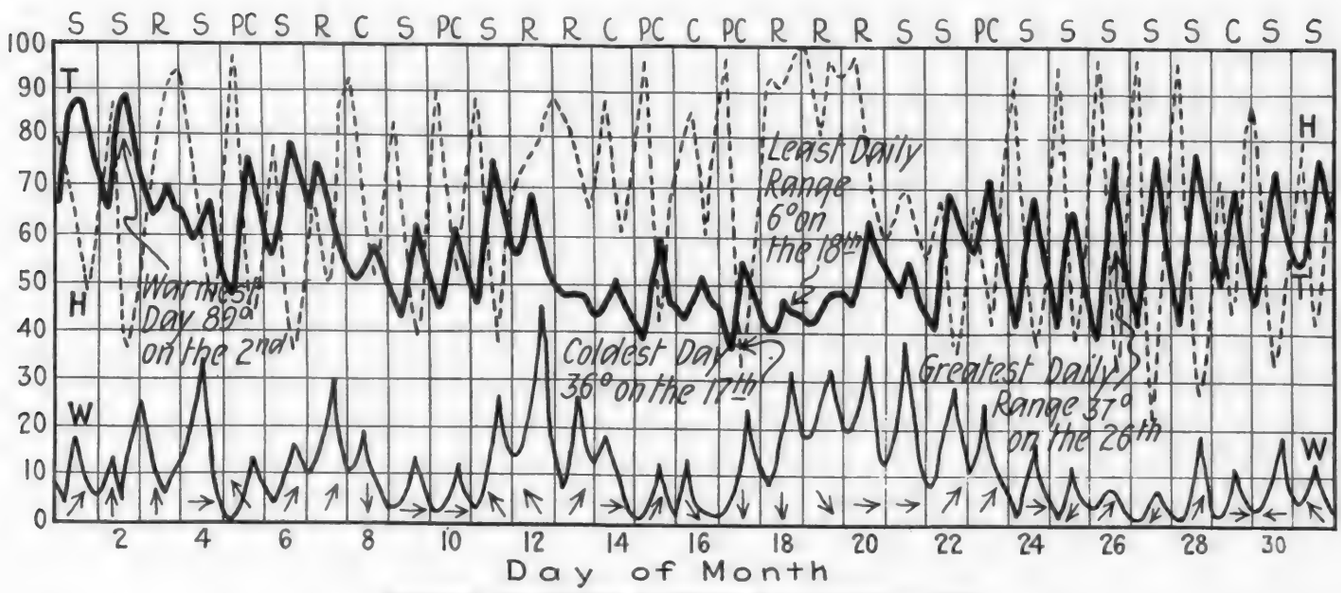
Warmest Day 89° on the 1st
Greatest Daily Range 33° on the 28th
Coldest Day 36° on the 30th
Least Daily Range 7° on the 27th
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Record of the Weather in Boston for October, 1927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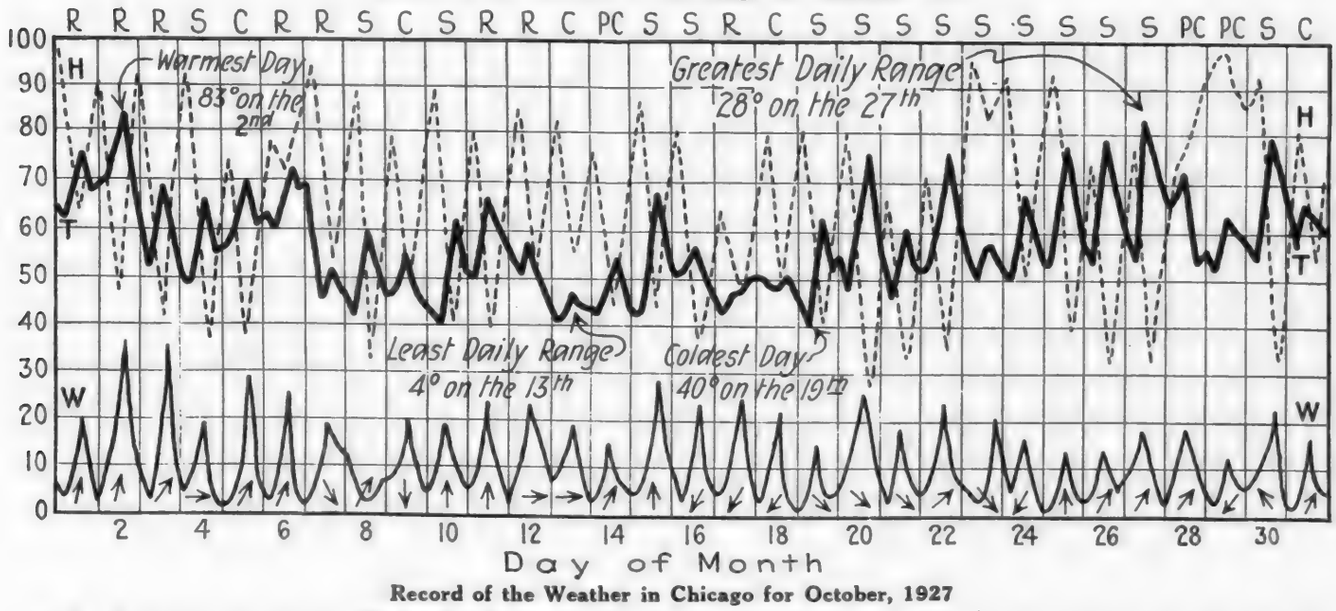
Warmest Day 89° on the 2nd
Least Daily Range 6° on the 18th
Coldest Day 36° on the 17th
Greatest Daily Range 37° on the 26th
Day of Month

Record of the Weather in Pittsburgh for October, 1927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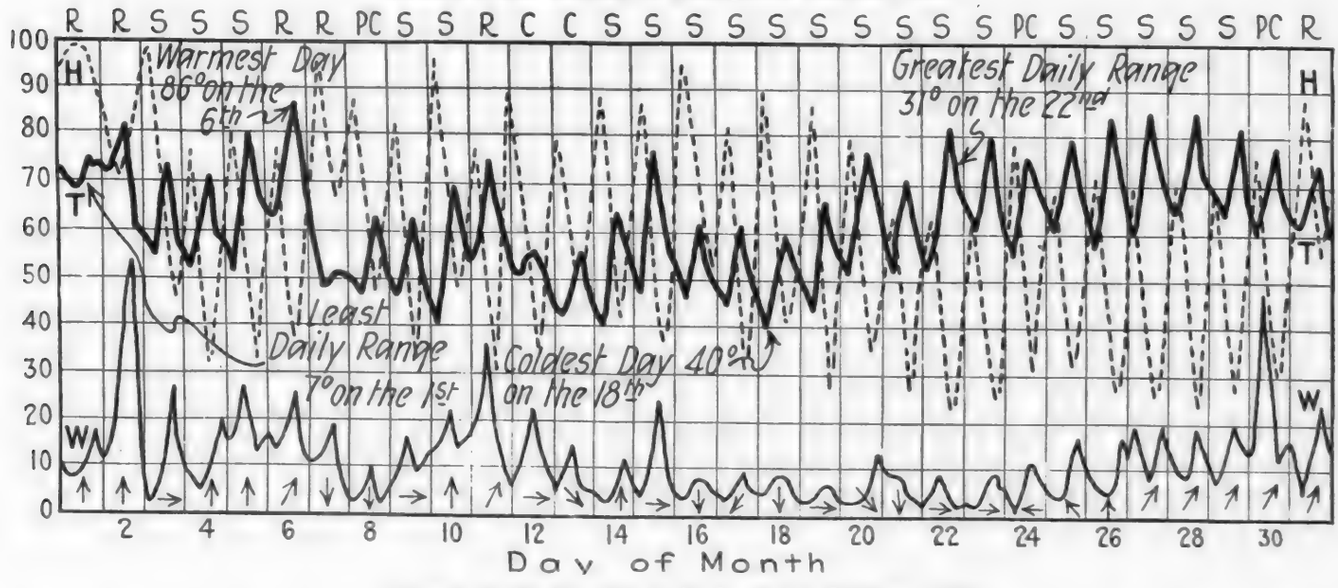
Warmest Day 83° on the 2nd
Greatest Daily Range 28° on the 27th
Least Daily Range 4° on the 13th
Coldest Day 40° on the 19th
Day of Month

Record of the Weather in Chicago for October, 1927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Warmest Day 86° on the 6th
Greatest Daily Range 31° on the 22nd
Least Daily Range 7° on the 1st
Coldest Day 40° on the 18th
Day of Month

Record of the Weather in St. Louis for October, 1927

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degree F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M.
S—Clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

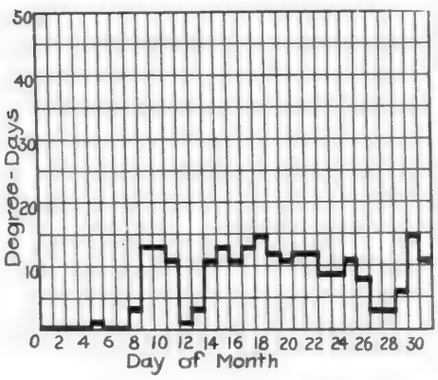
Monthly Heating Loads in Degree-Days
In Five Typical Cities

SINCE November, 1906, THE HEATING AND VENTILATING MAGAZINE has furnished to its readers (during the heating season) monthly weather charts graphically showing fluctuations in temperature, windage and humidity in five important and typical cities.

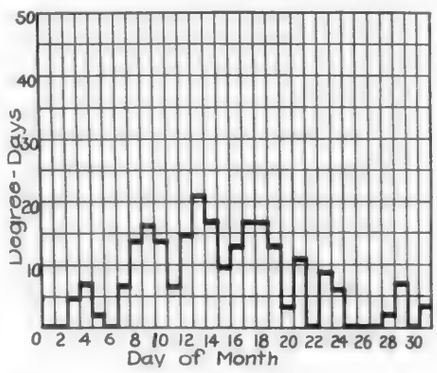
In September, 1925, there was presented the Iso-Degree-Day Chart of the United States, marking another important contribution to the science of heating and ventilation.

With this issue, there will be published, during the heating season, monthly graphs showing the daily heating load in degree-days for New York, Boston, Pittsburgh, Chicago and St. Louis. The integration of each monthly curve will be given in degree-days; also the total heating load for the current heating season, to date.

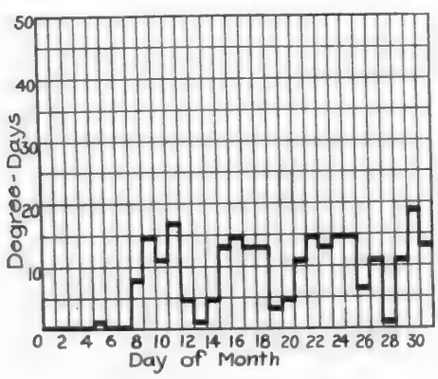
These charts are so drawn that the continuous heating load for any city can be built-up by cutting out the several charts and pasting them along a pencilled base line. The story of this method of measuring the heating load, and some of the many applications, will be found in THE HEATING AND VENTILATING MAGAZINE for September and November, 1925.



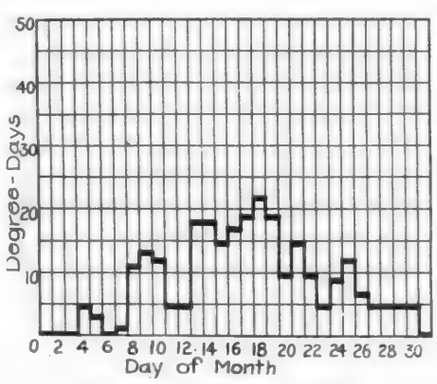
New York, October, 1927
Degree-Days 230—Degree-Days to Date 230



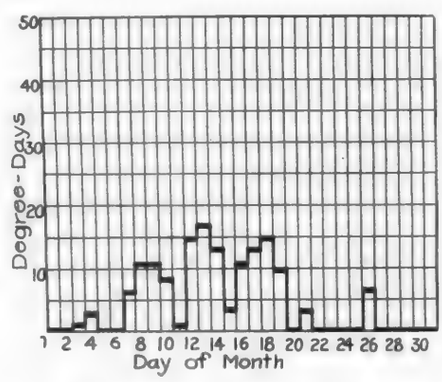
Chicago, October, 1927
Degree-Days 236—Degree-Days to Date 236



Boston, October, 1927
Degree-Days 256—Degree-Days to Date 256



Pittsburgh, October, 1927
Degree-Days 271—Degree-Days to Date 271



St. Louis, October, 1927
Degree-Days 142—Degree-Days to Date 142

What Degree-Days Are

The "degree-day" is a unit developed by the American Gas Association and represents the *product of one degree of temperature, and a time factor of one day.* Through a study of actual conditions, the American Gas Association determined that the minimum temperature of bodily comfort in the home is reached when the mean daily temperature falls below 65° F. It must be borne in mind that, with a daily *mean* temperature of 65° F., the day-time temperature will average around 70° F., and the only time room temperatures would be below the comfort point would be around midnight. This explains the derivation of this arbitrary figure.

Manifestly, for each locality there may be determined the number of days of the year for which the average temperature is below 65° F. This period may be called the heating season.

If, then, we have a mean daily temperature of 60° F., it is evident that, for this day, we can measure the heat requirements by the figure "5 degree-days," whereas, had the mean temperature been 55° F., the heat requirement would be measured by "10 degree-days," or would be twice as great.

Summing up, therefore, for a week, or a month, or a heating season, we may express the aggregated heating load of any locality in units that permit comparison with that of any other point. Likewise, we may compare the heating requirements at any given place, during one heating season, with those of any other heating season. And so a "mild winter" or a "hard winter" becomes definable in accurate units that may be translated into B.T.U. Basing these units on the very accurate data of the weather bureau over a period of fifty years, a high degree of accuracy results.

American Society of Heating and Ventilating Engineers

Minnesota Chapter Inspects Minneapolis Auditorium

At the October meeting of the Minnesota Chapter, held at the Minneapolis Municipal Auditorium, October 24, D. M. Forfar described and showed lantern slides of some of the features of the new Minneapolis Auditorium and pointed out some of the important features of the equipment which later were inspected in a tour of the building. The party was divided into four groups of 30 men each, and was taken from subbasement to roof, as well as through the main air duct under the roof.

Meetings Program of Ontario Chapter

The 1927-1928 program of the Ontario Chapter was announced at the chapter's first fall meeting, October 3. On November 11, Dean F. Paul Anderson, president of the society, was the guest of the chapter. At the meeting scheduled for December 5, R. W. McHenry, chapter president, was to preside. No meeting is scheduled in January. On February 6, C. A. Thinn will deliver a talk on the "Differential Vacuum Heating System;" March 6, Lionel Jacobs will discuss "House Heating Boilers Adaptable for Oil Burning;" April 3, Edward Addy will address the members on the new Toronto West End Technical School; May 2, Stuart Peterkin will give a talk on "Unit Heaters," and at this meeting election of officers will take place. The final meeting will be held June 5, and will be an organization meeting.

Officers elected to serve for 1927-28 are: President, R. W. McHenry; vice-president, E. B. Sheffield; secretary-treasurer, J. S. Patterson. Board of governors, H. R. Flett, A. S. Leitch and A. J. Dickey.

Professor Emswiler Addresses Michigan Chapter

As a guest speaker at the November meeting of the Michigan Chapter, held in the Imperial Hotel, Detroit, Monday evening, November 14, Prof. J. E. Emswiler, of the University of Michigan, presented a paper on "Natural Ventilation of the Factory Type of Building." The speaker pointed out that ventilation of the average factory could be accomplished by natural means through the utilization of the aeromotive force of the wind and by employing the heat generated within the building to create a positive flow of air.

A lengthy and general discussion indicated the interest in the subject. The meeting was presided over by President Calvert.

National Fire Protection Association's Technical Committee Program

Among the many projects on which technical committees of the National Fire Protection Association are, or have been, working, are several of direct interest to heating men, notably, the compilation of regulations on Blower systems, flammable liquids, garages, protection of openings in walls and partitions and tanks.

The report of the blower systems committee, adopted in May, 1927, comprised a complete revision of the existing regulations which now cover heating and ventilating systems, systems for removal of flammable vapors and dust, stock and refuse in conveying systems.

The flammable liquids committee has under consideration, among other things, regulations for the construction of rooms, cabinets, outside houses for the storage of flammable liquids (tentatively adopted in 1927), amendments to oil-burning regulations and vent installations and tanks. Regulations under the jurisdiction of this committee include those for containers for flammable liquids, concrete tanks for fuel oil storage, oil-burning equipments (including domestic burners) and recommended practice for freeing oil tanks of flammable vapors.

The suggested ordinance regulating the use, handling, storage and sale of flammable liquids and other products thereof, while based in its technical features on the recommendations of this committee, is drafted by the Committee on Laws and Ordinances.

In connection with the work pertaining to the construction and operation of bus garages, it is stated that this year the committee will review and revise this report prior to presentation for action at the next annual meeting. Following the completion of the regulations on bus garages, the committee will take up other types of garages, including those for taxicab and public use. It will be recalled that the preliminary draft of this report was presented at last summer's meeting of the A. S. H. & V. E. and aroused considerable discussion, with a number of suggestions for its revision.

On the subject of tanks, the regulations prepared by the committee, and published in 1926, are up for amendment

New Publications of the N. F. P. A.

Technical Committee Program for 1927-1928 has been issued by the National Fire Protection Association, Boston, Mass. This booklet outlines the current activities and plans of the association's technical committees.

Pulverized Fuel Systems is a pamphlet which supersedes the edition of 1924, and which has officially been approved as an American standard by the American Engineering Standards Committee. The present revision has been prepared by the Committee on Dust Explosion Hazards and was adopted by the association at the last annual meeting.

Protection of Openings in Walls and Partitions is a pamphlet, superseding the 1918 edition, which incorporates the changes recommended by the Committee on Protection of Openings in Walls and Partitions and adopted in 1926 and 1927.

Heating and Piping Contractors National Association

Certified Heating to Be Pushed

A comprehensive campaign for the advancement of certified heating will be carried out under the direction of the Committee on Certified Heating. The campaign basically will consist of a series of five circulars, in color, for successive mailing to architects, engineers, builders and others who constantly are in the market for heating installations. A booklet also is being prepared for distribution to prospective home builders.

It is understood that the Chicago association has taken such a leading part in the development of the certified heating idea, that the national association, through the courtesy of the Chicago group, will be able to cary on this campaign with literature and ideas already used in the local Chicago campaign, in which they have proved eminently satisfactory.

Local associations will join with the national body in carrying out the campaign, and it is expected that the result will be a marked increase in homes boasting of certified heating installations.

New Local Associations Join National Body

Local associations of heating and piping contractors in Norfolk, Va., and Portland, Ore., have become affiliated with the national association, adding strength to this organization. Both of these locals are aggressive and their executives and directors are outstanding men in their respective communities.

Heating and Ventilating Exhibitors at Power Show

Grand Central Palace, New York, December 5-10, 1927

737 738 **Absolute Con-Tac-Tor Corp., Elkhart, Ind.,** automatic electrical controls for oil burners, coal burners, gas burners, unit heaters, booster fans, domestic and commercial refrigerating machines; mercury switches and magnetic valves for gas and oil.

14a **Aerofin Corp., Newark, N. J.,** Aerofin heaters.

625 **Alexander Bros., Inc., Philadelphia, Pa.,** tentacular transmission belt.

319 to 322 **American Blower Co., Detroit, Mich.,** air filters and dust collectors in working exhibit.

65 **American Brass Co., New York, N. Y.,** condenser tubes; turbine blading of nickel bronze; various shapes of cupro alloys; tobin bronze turned piston rods and shafting; Anaconda line of sheets, wire, rods and tubes.

770 **American Pipe Bending Machine Co., Inc., Boston, Mass.,** three hand-operated and one motor-operated pipe bending machines.

74 **American Schaeffer & Budenberg Corp., Brooklyn, N. Y.,** American industrial instruments for indicating, recording and controlling temperatures, pressures and speeds, consisting of gauges, valves, thermometers, tachometers, temperature controllers, pressure controllers, recording gauges, recording thermometers, gauges testers, dial thermometers, etc.

573 **American Society of Heating and Ventilating Engineers, New York,** test of window infiltration in Grand Central Palace.

215 216 **Armstrong Cork & Insulation Co., Pittsburgh, Pa.,** Armstrong's insulating brick, suitable for temperatures up to 2500°; Nonpareil insulating brick; Nonpareil high-pressure covering for high-temperature steam lines, Armstrong's corkboard, cork covering, cork tile and linotile for office floors.

275 **Armstrong Machine Works, Three Rivers, Mich.,** extensive line of steam standard and compound traps; a working glass model operating under steam pressure.

612 **Atlas Valve Co., Newark, N. J.,** Campbell boiler feed-water regulator, reducing valves, damper regulators, temperature regulators, pump governors, float valves, swing joint fittings, thermostats and balanced valves.

552 553 **Atwood & Morrill Co., Salem, Mass.,** relief, bleeder, and reducing valves, adjustable combination regulator and strainers.

436 **Badger & Sons Co., E. B., Boston, Mass.,** expansion joints.

51 **Bailey Meter Co., Cleveland, O.,** meter panel boards, boiler meters, electrically and mechanically operated fluid meters, pressure and temperature recorders, tachometers, and multi-pointer gauges. Also the Bailey meter control.

312 313 **Barnes & Jones, Boston, Mass.,** steam heating specialties, thermostatic radiator traps, blast, vent, vacuum return and boiler return traps, steam and water modulation valves.

70 71 **Bethlehem Steel Co., Bethlehem, Pa.,** a full-sized Bethlehem pulverizer in operation; a Bethlehem type S Diesel engine, parts of large Diesel engine; turbo-driven centrifugal feed pump.

243 **Bridgeport Brass Co., New York.**

12 **Bristol Co., Waterbury, Conn.,** indicating and recording thermometers, tachometers, pressure gauges, pyrometers and temperature control equipment.

34 **Brown Instrument Co., Philadelphia, Pa.,** large photographic reproductions graphically featuring uses of the Brown electric flow meter; indicating and recording types, connected to a Brown manometer actuated by visitors to the booth; indicating and recording thermo-electric pyrometers; electric CO_2 meters; draft, pressure and vacuum gauges; multiple-duplex recording resistance thermometers; electric tachometers and indicating and recording thermometers.

73 **Buffalo Forge Co., Buffalo, N. Y.,** mechanical draft equipment, heating and ventilating apparatus, air preheaters, unit heaters, punches and shears.

73 **Buffalo Steam Pump Co., Buffalo, N. Y.,** steam pumps, boiler feed, circulating, sump and house service pumps.

8 **Bundy Steam Trap Co., New York,** working exhibit of Bundy steam traps.

Sp.A **Burhorn Co., Edwin, Bayonne, N. J.,** cooling tower in operation.

442 443 **Byers Co., A. M., Pittsburgh, Pa.,** Van Stoned and welded joints, coils and samples of an educational nature to show the process of manufacturing Byers pipe.

554 **Cameron Steam Pump Works, A. S. (Division of Ingersoll-Rand Co.), New York,** Cameron pumps. Service condensers, stationary compressors.

295 **Carrick Engineering Co., Chicago,** automatic combustion-control equipment including Carrick mercury-actuated master control, furnace regulators, and Carrick adjustable chronometer valve.

14a **Carrier Engineering Corp., Newark, N. J.,** a model of the Carrier centrifugal refrigeration unit; a Carrier unit air conditioner; Carrier gas heating and air conditioning unit for the home, and other specialized equipment.

28 **Cash Co., A. W., Decatur, Ill.,** aluminum models and stock samples of standard pressure-reducing and regulating valves; various controllers which make up the Craig system of automatic combustion-control shown under conditions approximating actual service.

14 **Celite Products Co., Los Angeles, Calif.,** Silocel and allied insulations.

712 713 **Century Electric Co., St. Louis, Mo.,** single-phase, polyphase and d.c. motors, featuring Century wool yarn system of lubrication.

2 **Chapman Valve Mfg. Co., Indian Orchard, Mass.,** steel valves.

693 **Chicago Chemical Co., Chicago.**

636 to 639 **Chicago Pump Co., Chicago,** condensation, sewage, booster, vacuum, and bilge pumps.

244 245 **Clarage Fan Co., Kalamazoo, Mich.,** unit heater and humidifier and bakery humidifier.

67 **Cochrane Corp., Philadelphia, Pa.,** Cochrane conical strainerless filter with single control; constant-flow valves; pipe flow-meters for measuring water, steam or air; Cochrane chemical proportioner and feeder in operation; deaerating heater with vent condenser; Cochrane steam and oil separators, traps and drainers; multiport valves used for controlling back pressure in steam-heating systems.

43 **Connery & Co., Inc., Philadelphia, Pa.,** improved expansion stiffener, air-cooled damper and expansion stack-extension.

316 **Continental Valve & Mfg. Co., Framingham, Mass.,** valves and fittings.

760 761 **Cork Foundation Co., Inc., New York,** the use of cork for absorption of vibration and noise of machinery, such as fans, blowers and motors.

52 462 463 464 **Crane Co., Chicago,** typical valves and fittings of brass, bronze, cast-iron, ferro-steel, cast-steel and forged steel to cover full range of pressures and temperatures encountered in general practice. The feature will be a large-sized gate valve in section.

98 **Crosby Steam Gauge and Valve Co., New York,** new nozzle-type safety valve for pressures up to 1500 lbs. per square inch; a reseating tool which permits reseating of safety valves in position; specimens of gauges and blow-off valves.

454 **Cutler-Hammer Mfg. Co., Milwau-**

455 **kee, Wis.,** across-the-line automatic starters for a.c. motors; motor-operated unit for controlling valves; electric space and tubular heaters.

415 **Davis Engineering Co., New York,** 416 feed water heaters, steam traps, domestic water heaters, feed water filters and other special equipment.

267 **Davis Regulator Co., G. M., Chicago,** pressure regulators.

769 **DeBothezat Impeller Co., New York,** direct and pulley-driven pressure fans; bifurcator with 24-in. pressure fan; DeBothezat double-disc high-pressure mining fan; several small fans for special purposes and a demonstration to show the high static pressure developed by these fans.

10 **d'Este Co., Julian, Boston, Mass.,** Curtis engineering specialties; pressure-reducing valves for steam, air and water, steam traps, combustion controls and tank valves.

249 **Domestic Stoker Co., New York.**

701 **Dunham Co., C. A., Chicago,** work-702 ing units of the DH series pump, the D26 Dunham differential vacuum pump, and the Dunham condensation pump and receiver. Also Dunham radiator, float, thermostatic, and return traps, air eliminators, packless radiator valves and other specialties.

471 **Economy Pumping Machinery Co., Chicago,** centrifugal pumps including double-suction horizontal split-case single-stage pumps; multi-stage heavy-duty boiler-feed pumps, automatic sump pumps, condensation pump and receiver and a return-line vacuum pump.

326 **Fairbanks, Morse & Co., New York,** to a.c. and d.c. motors, a high speed, 331 high head, ball-bearing centrifugal pump in operation and other centrifugal and power pumps.

605 **Farnsworth Co., Conshohocken, Pa.,** a newly developed drainage receiver and pump that meters high-temperature liquids and records the temperature and indicates the exact time the high-temperature water was received, as well as delivering it to boilers or to any point of use. Also steam specialties.

535 **Federal Gauge Co., Chicago,** Mer-& coid system of direct control for 544 starting and stopping electric motors by means of changes in pressure, temperature, vacuum, fluid levels, etc. High and low water safety control devices.

35 **Fisher Governor Co., Marshalltown, Ia.,** pump governors, steam traps, liquid level controllers, gas regulators, reducing, back-pressure and differential valves and remote controls.

84 **Foster Engineering Co., Newark, N. J.,** automatic valves featuring drop-forged, cast-steel chrome constructions for high pressures and temperatures; all-chrome non-return stop valves; pressure reducing regulators and pump governors. The Foster sight flow box will be shown in actual operation.

20 **Foster-Wheeler Corp., New York,** & full-sized sections of Foster sec-64 tional air heater; Wheeler steam-jet vacuum pump and an elaborate exhibit of Crescent brand brass and copper tubing and pipe; full-sized sections of Foster superheaters; water-cooled furnace surface and water back.

62 **Foxboro Co., Inc., Foxboro, Mass.,** indicating and recording thermometers and pressure gauges; draft gauges; boiler water-level recorders; tachometers; flue-gas recorders; multiple-pen recorders and standard power-plant instruments.

657 **Frank Heater & Engineering Co., O. E., Buffalo, N. Y.,** heat-exchange equipment.

252 **Fulton Sylphon Co., Knoxville,** 253 **Tenn.,** apparatus for the control of temperature of air and liquids.

685 **Garden City Fan Co., Chicago,** cycloidal and multiblade type fan with motor mounted on fan casing using short center tentacular drive; Cyclo-Fin unit heater with direct connected propeller fan; positive pressure blower and a cycloidal exhauster.

4-5 **General Electric Co., Schenectady, N. Y.,** the feature of this exhibit will be a demonstration of atomic hydrogen welding as developed by Dr. Irving Langmuir of the General Electric laboratory. This invention now makes possible the welding of hitherto unweldable metals with none of the ill effects of oxidation. The exhibit also will include motors and controls, a centrifugal air compressor and a small turbine battery-charging equipment.

86 **Gillis & Geoghegan, Inc., New**
87 **York,** electric and hand power models of ash handling equipment.

530 **Grinnell Co., Providence, R. I.,**
531 fabricated piping; serrated, sargol,
548 tongue-and-groove and plain laps;
549 test pieces showing coupling, weld, butt-weld and lap joints complete with lap-joint flanges; Grinnell adjustable pipe hangers and supports.

49 **Griscom-Russell Co., New York,** Bentube evaporators and heat exchangers.

26 **Hardinge Co., York, Pa.,** Hardinge unit coal pulverizer, Ruggles-Coles dryer, Hardinge thickener and clarifier.

81 **Hays Corp., Michigan City, Ind.,** Hays pointer gauges for draft, pressure and differential draft or pressure; Hays automatic CO_2 and draft recorders; inclined-tube and direct-reading gauges; portable test sets and improved gas analyzers.

707 **Heat Transfer Products, Inc., New York,** heat exchangers; oil heaters.

651 **Heating and Ventilating Magazine Co., New York,** periodicals, data sheets; Iso-Degree-Day charts and books, including "House Heating with Oil Fuel."

212 **Hill Co., E. Vernon, Chicago,** air-testing instruments, featuring new designs of wet and dry-bulb thermometers, filter gauges, draft gauges, pitot tubes, dust testing outfits, CO_2 analyzers, sychrometers, thermometers, anemometers, microscopes and stop watches, also the "Aerologist," a publication.

633 **Hoffman Specialty Co., Inc., Water-**
634 **bury, Conn.,** complete line of venting valves and controlled heat equipment.

443 **Homestead Valve Mfg. Co., Home-**
444 **stead, Pa.,** extensive line of valves for special purposes.

278 **Ilg Electric Ventilating Co., Chicago,** fans, blowers and unit heaters.

233 **Illinois Engineering Co., Chicago,** heating, steam, and power specialties.

440 **Instant Water Heater Sales Division, Chicago,** instantaneous water heater using steam as a heating medium, also a flow control used in conjunction with that heater.

437 **Insulating Products Corp., New York,** Diamite (Diatomaceous earth) insulation; Therminsul insulation.

682 **Iron Fireman Automatic Stoker**
683 **Corp., New York,** under-feed automatic coal burner.

90 **Jenkins Bros., New York,** bronze and iron valves, Moncrieff gauge glasses and a new forged steel valve made by the extrusion process for high pressures.

314 **Johns-Manville Corp., New York,**
315 radiator traps, steam traps and radiator control valves; insulating materials for high temperatures.

403 **Johnson Service Co., Milwaukee,**
404 **Wis.,** heat control equipment, featuring in operation dual type thermostats operating dampers and valves. Thermostats, thermometers and sylphon diaphragm valves.

229 **Keating Pipe Bending & Supply**
230 **Co., E. F., Hartford, Conn.,** Van Stone joints made from steel and wrought-iron pipe; bends, welded flanged headers and pipe coils.

211 **Keeler Co., E., Williamsport, Pa.,** Keeler water-tube boilers.

533 **Kieley & Mueller, Inc., New York,**
534 pressure-reducing valves and complete line of specialties.

627 **Korfund Co., Inc., New York,** Korfund products will be shown in connection with a steam engine in actual operation.

766 **Lincoln Electric Co., Cleveland, O.,**
767 working exhibit of Stable-Arc welders; Linc-Weld motor operating submerged in glass tank.

265 **Linde Air Products Co., New York,**
266 acetylene welding and cutting equipment and allied specialties.

672 **Liquidometer Co., Inc., Long Island City, N. Y.,** complete line of distant-reading liquid level gauges operating on balanced non-pressure hydraulic principle.

444 **Locke Regulator Co., Salem, Mass.,**
445 pressure-reducing, safety shut off, float control, exhaust relief, non-return and balanced valves; damper and hydraulic regulators.

223 **Mason Regulator Co., Boston, Mass.,**
224 pressure-reducing valves; an all stainless steel balanced valve; complete working model of boiler room featuring pressure-reducing valves especially adapted for heating service.

407 **Metal Stamping Co., Long Island City, N. Y.,** Convecto heat unit cabinets for exposed radiation; Convecto all-copper extended-surface radiator.

268 **Midwest Piping and Supply Co., St. Louis, Mo.,** specialized fittings for high pressure piping, including Globack joints for 600, 900 and 1350 lbs. working steam pressure.

635 **Modine Mfg. Co., Racine, Wis.,** working exhibit of TherModine unit heaters, cabinet radiators and concealed wall radiators.

66 **Nash Engineering Co., South Norwalk, Conn.,** complete line of Jennings pumps.

671 **National Regulator Co., New York,** equipment for the control of temperature; boiler regulators for high-pressure, low-pressure and vapor systems.

8a 8b **National Tube Co., Pittsburgh, Pa.,** pipe and tube products, including sections of large pipe for steam power lines.

608 609 **Nelson Corp., Herman, Moline, Ill.,** Herman Nelson hiJet unit heaters; Univent; Herman Nelson invisible radiators and radiator sections.

19 **Northern Equipment Co., Erie, Pa.,** working exhibit of Copes feed water regulator. Other features will be a pump governor, condensate drainage control and various types of Copes control valve.

747 748 **Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.,** PeerVent heating and ventilating unit.

3 & 28 **Permutit Co., New York,** model of water softening and filtering equipment. Ranarex instruments for recording CO_2 and gas density.

420 421 **Pittsburgh Piping and Equipment Co., Pittsburgh, Pa.,** fabricated piping and cast-iron and cast-steel fittings.

494 495 **Powell Co., William, Cincinnati, O.,** comprehensive line of bronze, iron and steel globe, anglo, gate, check and safety valves. Educational exhibit showing processing from foundry to finished product.

640 **Powers Regulator Co., Chicago,** systems of control for buildings and control appliances for industrial operations.

48 **Pratt & Cady Co., Bridgeport, Conn.,** bronze, cast-steel and iron valves and fittings.

304 305 **Preferred Utilities Mfg. Corp., Inc., New York,** Ray oil burner, Preferred damper, anti-siphon valve, foot valve, vent protector and foot box; Preferred multiple-control panel, double tapped bushings.

306 307 **Pyramid Iron Products Corp., New York,** standard and special types of Pyramid grate bars adapted to burn small sizes of anthracite, bituminous and lignite coals; Pyramid forced draft blowers.

89 **Quigley Furnace Specialties Co., Inc., New York,** a three-reel motion picture will be shown indicating the various uses and proper mixtures of Hytempite, a high temperature cement; exhibits of Hytempite, a refractory fire sand, and the Quigley refractory gun; other furnace lining specialties.

304 **Ray Mfg. Co., W. S., San Francisco, Calif.** (See Preferred Utilities Corp.)

229 **Reading Iron Co., Reading, Pa.,** genuine wrought-iron pipe and other tubular goods.

209a **Reed Air Filter Co., Louisville, Ky.,** automatic air filters and Circulair heat.

620 621 **Reliance Electric & Engineering Co., Cleveland, O.,** a.c. and d.c. motors with specialized protection devices for use where motors are required to operate in unusual locations.

82 **Reliance Gauge Column Co., Cleveland, O.,** working exhibit of forged-steel Reliance safety water column with high and low alarms for 750-lb. working pressure; two similar set-ups for lower pressures; detail parts.

6 **Republic Flow Meters Co., Chicago,** Republic boiler meter panel, including multiple recorder which will record six individual records simultaneously on a single wide strip chart; complete line of Republic steam flow, water and CO_2 meters, draft instruments, pyrometers and liquid level indicators and recorders.

669a 670 **Rome Brass Radiator Corp., New York,** Robras light weight welded all-brass heat exchanger for low and high-pressure steam heating, and blast and unit heating.

558 to 560 **Ruggles Klingemann Mfg. Co., Boston, Mass.,** regulating motor-operated, chronometer, solenoid-operated and special balanced valves; step-action hydraulic damper regulators and motor-operated regulators.

33 **Sarco, Co., Inc., New York,** steam traps, temperature regulators and complete line of Sarco heating specialties.

334 335 **Schutte & Koerting Co., Philadelphia, Pa.,** jet appliances for pumping liquids and handling air and gases by means of live steam, compressed air and pressure liquids. Radiafin tubes for heat transfer.

496 **Shaw Co., Benjamin F., Wilmington, Del.,** fabricated piping.

519 **Simmons Co., John, New York,** pipe bends, coils, coal-saving devices and heating specialties.

652 **Simplex Oil Heating Corp., New York,** pressure blowers, oil burners.

456 **Skidmore Corp., Chicago,** Skidmore return-line vacuum and boiler feed pump.

452 453 **Spencer Turbine Co., Hartford, Conn.,** Spencer turbo compressor and stationary vacuum cleaning equipment for large buildings.

410 to 414 483 484 **Sturtevant Co., B. F., Hyde Park, Mass.,** Turbovane forced-draft and induced draft fan; propeller and Wind-O-Vane fan; tubular and plate-type air heaters; multistage compressors; coal-burning blower and Big Midget blower; portable and stationary vacuum cleaners; steel pressure blowers.

696 697 **Swartwout Co., Cleveland, O.,** feed water regulators, pump governors, master controls, drainage controls, regulating valves, steam traps; steam, air and water separators, return traps, feed water heaters and ventilators.

699 **Sword Silent Oil Burner Corp., New York,** Sword Silent oil burner and Century oil burner.

59 **Tagliabue Mfg. Co., C. J., Brooklyn, N. Y.,** steam-operated controller for temperature and pressure, recording thermometers; pressure and vacuum gauges; flue-gas analysis indicator recorder; oil-testing instruments.

507 **Taylor Instrument Companies, Rochester, N. Y.,** Tycos industrial, dial-type, and recording thermometers; pressure gauges; pyrometers; temperature and pressure regulators; long-distance electric transmitting-recording instruments for pressure or temperature.

720 **Toledo Pipe Threading Machine Co., New York,** threading and cutting tools, vises and work benches.

45 **Uehling Instrument Co., Paterson, N. J.,** electrically-operated Apex CO_2 recorder and indicator; Uehling combined barometer and vacuum recorder, and other laboratory and commercial instruments.

217 218 **Vinco Co., Inc., New York,** three miniature heating systems built entirely of glass showing what happens to different parts of heating systems when dirty.

407 **Vulcan Radiator Co., Hartford, Conn.**

44a & 308 to 311 **Walworth Co., Boston, Mass.,** valves for standard and special service; Walworth pipe tools.

225 226 **Warren Webster & Co., Camden, N. J.,** refinements in Webster systems of steam heating and Webster equipment; series 78 traps for process steam pressures.

39 **Watts Regulator Co., Lawrence, Mass.,** valves and regulators.

564 to 566 **Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.,** a complete line of Westinghouse stoker and steam turbine equipment.

61 **Wing Mfg. Co., L. J., New York,** turbo-blower and motor-driven blower; feather weight unit heater; Scruplex exhauster and Scruplex fan.

487 to 489 **Worthington Pump & Machinery Co., New York,** high-pressure, multistage centrifugal pump for boiler feed, specialized pumps for various services.

255 **Wright-Austin Co., Detroit, Mich.,** steam traps, separators and water columns; Airxpel bucket steam traps; Kleervu gauge glass protector.

701 702 **Young Pump Co., Chicago.** (See C. A. Dunham Co.).

259 **"X" Laboratories, New York,** demonstration of "X" liquid as used to stop leaks and as rust and scale eliminator.

National District Heating Association to Hold the 1928 Convention in Atlantic City

At a meeting of the executive committee of the National District Heating Association, held in New York, November 8, at the offices of President Charles A. Gillham, who is also vice-president of the New York Steam Corporation, it was voted to hold the 1928 annual convention of the association in Atlantic City, N. J., at the Ambassador Hotel. The dates selected are June 12-15.

H. C. Kimbrough, Chicago district manager of the American District Steam Company, was again named as chairman of the entertainment committee.

George W. Barr Appointed General Sales Manager for Circulair

Circulair, Inc., of Louisville, Ky., recently organized by officers of the Reed Air Filter Company to market the new product—Circulair, has appointed George W. Barr as general sales manager. Mr. Barr is well-known throughout the heating industry. Until recently he was associated with the Fitzgibbons Boiler Company, and previously was assistant sales manager for the Hoffman Specialty Company. During the war he served as a major of ordnance, in intelligence and personnel activities.

Survey Shows Growth of School Building

Results of a survey have been issued by the United States Bureau of Education, showing that expenditures for sites, buildings, furniture, libraries, and apparatus of elementary and secondary schools combined, have increased from $35,450,820 in 1900, to $433,584,599 in 1925. The number of pupils enrolled in public high schools rose from 519,251 in 1900, to 3,650,903 in 1925.

The survey also reveals that school property increased in value 673.05% in the past 25 years, indicating that larger and better buildings have replaced smaller buildings of lesser value.

Since 1925 marks the close of the first quarter of the twentieth century, certain increases and improvements over 1924 are worthy of notice. The number of school buildings decreased 4,421, but the value of school property increased $507,548,186. Total expenditures increased from $1,820,743,936 to $1,946,096,912.

Statistics show that from 1900 to 1925, the population of school age has not kept pace with the general population, and, therefore, the group of children between the ages of five and seventeen, inclusive, has increased 38.78%, while those between the ages of five and fourteen increased 39.34%.

The number of school buildings has increased only 4.26% since 1900, this low increase being due largely to the fact that many one-room school buildings have been replaced by union, consolidated, or centralized schools, one new building taking the place of four or five smaller buildings.

Total cost of outlays, sites, buildings, and contents for 1925, was $433,584,559, or more than four times the amount spent in 1915, $102,756,375, and nearly three times the amount for 1920, $153,542,852.

Chicago School Board Studies Schoolhousing and Construction

Chicago Board of Education has received the report of a special committee assigned to make a comprehensive study of schoolhousing and construction problems in a group of eastern cities. The report showed that there has been a trend toward standardization of schoolbuilding construction and equipment. It was the opinion of architects that a larger unit of school building is more economical in cost of construction than a smaller building, and that operation and maintenance of larger buildings are more economical than in the case of smaller buildings.

The study also showed that for heating and ventilating systems a majority of the school buildings was equipped with the split system of heating and ventilating. In a number of sections, the unit system of ventilation has been installed. The practice of recirculating the air was studied, the survey showing that some cities do not permit the employment of this method, while some school boards are opposed to it even where it is permissible. The recirculation system, it is stated, was found to be economical in operation.

Among several recommendations made by the committee, it was suggested that the board make a study of heating and ventilating systems with a view of standardizing the mechanical equipment to insure greater efficiency and lower cost in operation, and also that the board prepare an amendment to the present building sanitary code with a view of eliminating those requirements which tend to increase the construction cost of school buildings.

Columbia University to Have Heating Research Residence

Announcement was made by Dr. Charles W. Brabbee, of the American Radiator Company, at the convention of heating and ventilating engineers in Germany recently, that the Pierce foundation, administered by the American Radiator Company, was arranging to erect and support a research residence at Columbia University, New York, to be devoted to heating, ventilating, sanitary and household engineering.

What Should Be Done to Protect Domestic Flue Pipes?

Information is desired as to the best method of reducing maintenance of metal flue pipes from domestic boilers and furnaces. Of what value are compounds designated as soot removers, or other chemicals reputed to prevent the accumulation of carbon in the flue pipe? Is it worth while to take down the piping at the conclusion of the heating season, clean and store it for the coming season? In what locations is scale a factor in the destruction of metal pipes, and what kinds of coal cause the most trouble?

THE HEATING AND VENTILATING MAGAZINE welcomes information from those who have had experience in this realm.

Deaths

J. JARVIS PREBLE, vice-president of the Spray Engineering Co., Boston, died at his home in Newton Highlands, Mass., October 20. Mr. Preble was born at Waltham, in 1888; was graduated from Harvard University in 1910 with a degree of B.S. After leaving the university he became associated with the engineering department of the Metropolitan Water Works in Boston. In November, 1914, he joined the staff of the Spray Engineering Company as engineer in charge of the air washer department, becoming associate engineer for the company in 1919. Mr. Preble was a member of the American Society of Heating and Ventilating Engineers, American Institute of Electrical Engineers, Boston Chamber of Commerce, and the masonic fraternity.

HERMAN W. OSTER, founder of the Oster Mfg. Co., Cleveland, O., recently died in his seventieth year. Mr. Oster, a native of St. Louis, Mo., had been a resident of Cleveland for 66 years.

CAPT. A. B. RECK, managing director of the Reck Heating Co., Ltd., Copenhagen, Denmark, died October 19, at the age of 77 years. Captain Reck was well known to the older members of the American Society of Heating and Ventilating Engineers, being the author of a paper on the Reck water heating system, presented at one of the society's early meetings. He was a member of the A.S.H. & V.E., as well as of the (British) Institution of Heating and Ventilating Engineers.

DAVID N. ARMSTRONG, president and general manager of the Armstrong Mfg. Co., Bridgeport, Conn., makers of pipe-cutting and threading machinery, died recently at his home in Huntington, a suburb of Bridgeport. Mr. Armstrong was 51 years old. His father, Frank Armstrong, established the Armstrong Mfg. Company in 1875. The business was afterward managed by David N. Armstrong and his brother, Charles H. Armstrong. Charles Armstrong died several years ago and at that time David N. Armstrong became president and general manager of the company.

Glancing Backward

High Lights in the Evolution of Leaders in the Heating and Ventilating Industry

III—The Powers Regulator Company

IN connection with the early history of the Powers Regulator Company, there is much of interest in a series of letters, or rather reminiscences, written for the *Thermostat*, the house organ of the company, by William P. Powers, founder and president. Other sources of information are the personal recollections and family records published by Mr. Powers a few years ago for private circulation.

William P. Powers, the founder of the business, is a native of Wisconsin. He is the oldest living alumnus of the University of Wisconsin, being a member of the class of 1860. He is a veteran of the Civil War. His success as an inventor has afforded him leisure for wide travel which accounts in part for his reputation as a delightful conversationalist and raconteur.

The Powers Regulator Company is a development of the heating and plumbing firm of W. P. Powers & Co., La Crosse, Wis. In one of his first contributions to the company's publication Mr. Powers gives the following account of what later led to the present organization.

"In 1887, after twenty years of strenuous and fairly profitable work in La Crosse, Wis., I erected a three-story brick building in which to continue the business of steam heating and plumbing. It was equipped with a hot water heating plant, the first one in the State, so far as I knew, it being then a new thing in this country. In the winter following, the heater developed a disposition to boil over, resulting in the discharge of a considerable part of the water through the expansion tank.

"This made necessary many hurried trips to the basement and caused much trouble. I began a mental search for some means to prevent this, and one Sunday during the sermon—which may have had some dull passages—the idea occurred to me of utilizing the relative boiling points of water under different pressures to control the draft. I could hardly wait for the benediction in my anxiety to consult the encyclopedia and verify my conception as to the effect of pressure on the boiling point.

"Early Monday morning I projected a pipe with a closed end into the boiler, filled it with water, attached a damper-controlling diaphragm, and by nine o'clock had it in operation and our troubles were over as far as boiling was concerned. This in principle was our No. 1 regulator, of which many thousands have been sold in the 40 years since that day.

"There was no more boiling over, but the office was often overheated and I began to study up some means to prevent that. Reasoning along the same line, it occurred to me that as the tube in the boiler limited its temperature at a point little above the boiling point of its contents, a tube in the air would do the same if charged with a liquid having a boiling point a little below the temperature desired.

"A druggist across the street told me of a hydrocarbon with a boiling point of about 60° F. I went to Chicago and procured a pint bottle of this fluid, came home and put up a tube in the office, connected it with a diaphgram valve on the radiator, filled the diaphgram and tube with water up to near the top, then put in a little of the volatile fluid, and a plug to confine it, and this constituted the first Powers thermostat. It gave good results so long as the fluid did not escape or become absorbed in the water.

"Before another heating season came on, I had made the disc thermostat with the corrugated partition forming a compartment in which the volatile liquid was confined and substituted the air column for the water, and this made a practical device, having, as I believed, a commercial value—which has since been fully demonstrated.

"These two regulators were later combined in a way to operate the dampers, resulting in our No. 4 regulator, which has met with a large sale.

"Realizing that there was a nation-wide field for this appliance, I went to Chicago in the Fall of 1890, leaving my son, F. W. Powers, in charge at La Crosse, he having been made a partner in the business a year or two before. This was later sold and he came to Chicago when the Powers Regulator Company was organized."

Upon coming to Chicago, Mr. Powers secured a small space in his father's wire mattress factory, then at the corner of Erie and Sedgwick Streets, and here were the modest beginnings of the new venture that before very many years was to grow to proportions justifying the purchase of the entire building and the occupancy of a large portion of it for the manufacture and distribution of the then well-known Powers product. In the interim, however, other quarters at different locations had been occupied, an office in the downtown district maintained and branch offices at various points established.

"In a previous article," writes Mr. Powers, "I told of the origin of the Powers regulator and showed how it, like most inventions, had necessity for its mother.

"For about three years our efforts were confined to residence work, and through advertising in the popular magazines, we sold a good many of the Nos. 1, 2, 3 and 4 regulators (for house-heating boilers and furnaces).

"At the World's Fair in 1893, we maintained an exhibit. It makes us laugh when we think of it now; such a contrast with our appliances of to-day. Crude at it was, it attracted considerable attention from the passing throng.

"Among others came a man from the East who had placed some of our machines in residences, and who, full of enthusiasm, told us of a large school in Long Island City that he was sure we could get by going after it. We went, having at the time more of nerve than of suitable apparatus. We equipped this building of 20 rooms, using dampers which were segments of circular drums, swinging in centers like pendulums over the hot and cold air openings and operated by 15-in. diameter round thermostats. Crude as it was, it worked and we were paid for it after trial and acceptance.

"We were looked upon as intruders by those already in possession of the heat-regulation field and our installation in the Long Island School was the signal for an attack, followed by years of litigation in the courts and merciless competition.

"Our method of operating dampers gradually and the ability to hold them in a mixing position as opposed to the open-and-shut method found favor with engineers everywhere and in the end gave us our rightful place in the sun."

The installation in the school at Long Island City (primitive though it was) proved to be the forerunner of many installations—thousands of them—which the Powers Regulator Company were to make in the years to come, not only in schools but in buildings of every type where the comfort and health of the occupants and the elimination of heat waste were a consideration. The steady expansion of the business was accompanied by constant improvement and evolution in the apparatus, by better methods of installation, greater accuracy of operation, the standardization of parts and the development of a more efficient and economic factory procedure.

Besides the installation of their systems of automatic temperature control in public buildings and the like, the Powers Regulator Company manufacture a varied and increasing line of

specialties applied to the plumbing and heating trades, such as hot water tank regulators, shower mixers, thermostatic water controllers, steam and water mixers, steam traps, etc. The company has developed apparatus designed especially for the demands in temperature control of the woodworking, textile, dairy, candy-making, laundry, paper-making, packing, leather and many other industries where the requirements are peculiar or unusually exacting. Thus the company has acquired a reputation as specialists in the art of temperature control.

The increasing business of the company is taken care of by sales and construction branches in all of the principal cities of the United States and by a subsidiary company, The Canadian Powers Regulator Co., Limited, in Canada. The home office and manufacturing plant are now housed in the company's own new, modernly-equipped building at 2720 Greenview Ave., Chicago, with F. W. Powers directing its policy and management. Eastern business is taken care of at the New York office, in charge of D. J. Powers. Both are sons of the founder of the business.

Of late years W. P. Powers has been less active in the affairs of the company, although always deeply interested, and its direction and conduct have been in the hands of his two sons above mentioned. To them is principally due its present prosperity and enviable record of achievement and service.

Publications

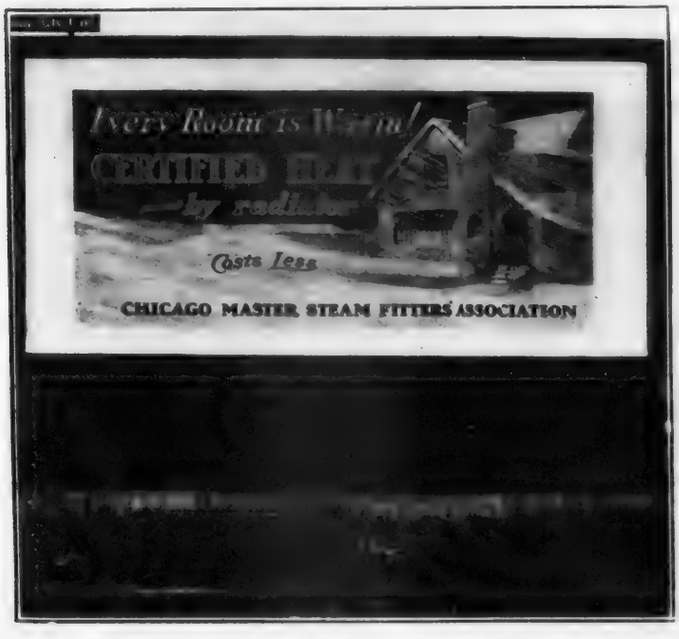
BULLETIN OF THE NATIONAL DISTRICT HEATING ASSOCIATION for October 15, 1927, is devoted to the heating rates of district heating companies in the United States and Canada. This is the tenth year in which the association has compiled these rates. The cities covered are the following:

Alexandria, Minn.
Albert Lea, Minn.
Anderson, Ind.
Auburn, N. Y.
Aurora, Ill.
Atlanta, Ga.
Atlantic City, N. J.
Aurora, Neb.
Adrian, Mich.
Baltimore, Md.
Bloomsburg, Pa.
Batesville, Ind.
Beaver Dam, Wis.
Benson, Minn.
Birmingham, Ala.
Bloomington, Ill.
Boulder, Colo.
Boston, Mass.
Butte, Mont.
Battle Creek, Mich.
Boone, Ia.
Bristol, Conn.
Bismarck, N. D.
Coatesville, Pa.
Carroll, Ia.
Canton, Ill.
Chicago, Ill.
Cleveland, O.
Canton, O.
Clinton, Ill.
Casper, Wyo.
Champaign, Ill.
Cheyenne, Wyo.
Clearfield, Pa.
Cedar Rapids, Ia.
Canby, Minn.
Detroit, Mich.
Davenport, Ia.
Louisville, Ky.
Logansport, Ind.
La Porte, Ind.
Lima, O.
La Crosse, Wis.
La Fayette, Ind.
Lincoln, Neb.
Lansing, Mich.
Manchester, Ia.
Milwaukee, Wis.
Minot, N. D.
Marion, Ia.
Mexico, Mo.
Missoula, Mont.
New Philadelphia, O.
New Castle, Ind.
Noblesville, Ind.
New York, N. Y.
Oak Park, Ill.
Oskaloosa, Ia.
Ottumwa, Ia.
Overbrook, Pa.
Paducah, Ky.
Peru, Ind.
Penn Yan, N. Y.
Perry, Ia.
Pittsfield, Mass.
Pontiac, Ill.
Peoria, Ill.
Pekin, Ill.
Pittsburgh, Pa.
Portland, Ore.
Phillipsburg, Pa.
Pottsville, Pa.
Quincy, Ill.
Red Oak, Ia.
Rochester, Ind.
Delaware, O.
Duluth, Minn.
Dayton, O.
Danville, Ill.
DeKalb and Sycamore, Ill.
Denver, Colo.
Eagle Grove, Ia.
Elwood, Ind.
Erie, Pa.
Evansville, Ind.
Eveleth, Minn.
Evanston, Ill.
Fargo, N. D.
Fort Scott, Kan.
Faribault, Minn.
Forsyth, Mont.
Frankfort, Ind.
Fremont, O.
Grand Forks, N. Dak.
Glendive, Mont.
Grinnell, Ia.
Grand Rapids, Mich.
Harrisburg, Pa.
Hudson, Wis.
Hibbing, Minn.
Hornell, N. Y.
Hillsboro, Ill.
Huntington, Ind.
Indianapolis, Ind.
Johnstown, Pa.
Kokomo, Ind.
Kansas City, Mo.
Little Rock, Ark.
Lockport, N. Y.
Rockford, Ill.
Rochester, N. Y.
Reading, Pa.
Renovo, Pa.
Sioux City, Ia.
South Bend, Ind.
St. Joseph, Mo.
Springfield, O.
San Diego, Calif.
St. Louis, Mo.
Streeter, Ill.
St. Paul, Minn.
S. St. Paul, Minn.
San Francisco, Calif.
Spokane, Wash.
Springfield, Mo.
Saginaw, Mich.
Scranton, Pa.
Springfield, Ill.
Salt Lake City, Utah.
Seattle, Wash.
Toledo, O.
Tacoma, Wash.
Towanda, Pa.
Terre Haute, Ind.
Virginia, Minn.
Waukegan, Ill.
Wilkes-Barre, Pa.
West Chester, Pa.
Wadena, Minn.
Watertown, S. D.
Windber, Pa.
Worcester, Mass.
Winnipeg, Canada.
York, Pa.
Youngstown, O.

In commenting upon the rates, the bulletin calls attention to the fact that a new element in rate making is coming forward in the form of a demand which is plus the condensation charge. The prediction is made that in the next ten years, the larger companies will sell their production, or at least a part of it on such a system. The standing committees of the association, it is added, are working on such a rate structure.

Chicago's "Certified Heat" Billboard Campaign

CHICAGO is learning about certified heat through an ambitious billboard campaign, being conducted by the Chicago Master Steam Fitters' Association. Effective posters, similar to those here reproduced, greet the eyes of home-owners, actual and prospective, at strategic points in the city, and carry the message of comfort and economy secured through the adoption of certified heating. Reports already received indicate the success of the campaign.



Two Typical Certified Heat Billboards in Chicago

New Apparatus and Appliances

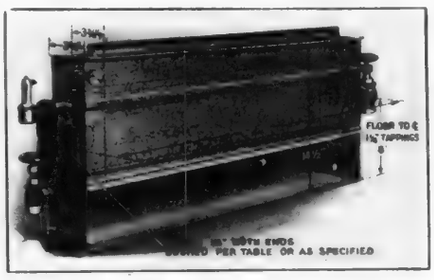
Carrier and Reed Produce New Heating Unit

CIRCULAIR, a clever coined word, describes the principal feature of the heat-exchange device announced by Circulair Heat, Inc., Louisville, Ky. It consists of an all-copper extended-surface element designed to be installed in walls or in cabinets, with distinctive means for securing a high rate of heat transfer, and for regulating the flow of air through the heating element.

The engineering organization of the Reed Air Filter Company working in collaboration with Willis H. Carrier, president of the Carrier Engineering Corporation, developed this unit. This fact will be taken as an assurance of the correct application of basic principles of thermo-engineering and of the overall efficiency of the new product. The officers of the new corporation are: J. F. Reed, president; H. C. Murphy, vice-president; and W. M. R. Reed, secretary-treasurer.

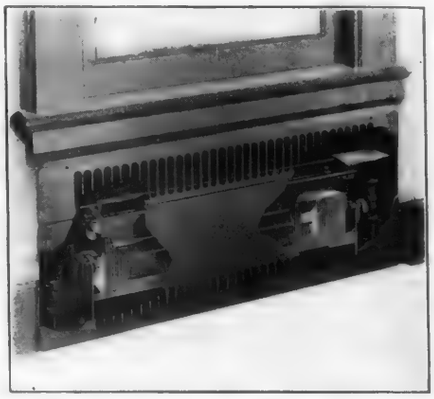
Circulair is designed, not alone to replace cast-iron radiation in liberating, into a given room, a definite amount of heat, but, in addition, to establish a definite circulation of the heated air—hence the name.

The heat-exchange element consists of a single oval copper tube with a rounded closed end. This form permits shape changes without liability to rupture and corresponds approximately, in diameters, to the rectangular dimensions of the extended surfaces, making for maximum transfer of heat to the outer portions. The copper plates forming the extended surfaces are die-stamped into shape with integral spacers and a collar which fits over the tube, giving greater contact therewith, and materially aiding conduction. After assembly on the tube the entire element is coated with tin, making a metallic unit of the whole, with no minute air spaces to retard heat conduction.



Circulair in Casing, Showing Air Intake at Bottom, Damper at Top, and Return and Air-Valve Fitting at Left

This assembly is attached, through a union, to a cast-bronze return and air-valve fitting, tapped for every possible connection to piping, tapped for air-valve and plugged for clean-out. The unit is fitted into a heavy sheet-metal casing, in horizontal position, just high enough from the bottom of the casing, forming the floor-line in any assembly, so that a proper air intake, with curved and hinged directing vane, results. If it is desired to pass outside air through the heater, this can be accomplished, and, by adjusting the curved vane at the base, the proportion of outside to recirculated air can be controlled at will.



Cutaway of Circulair, Showing Extended Surface Heat Transfer Element

Where installed as a wall unit, the heated air passes up a vertical duct and is delivered to the room through a curved outlet, up to 7 ft. above the floor line. It is stated that this unit will insure remarkable uniformity in temperature throughout the room because of the definite circulating effect obtained. As the installation is less than 4 in. thick, these vertical units, even when placed entirely within the room, can be decorated in harmony with the wall surfaces so as to be most inconspicuous.

A damper immediately above the heating element is controllable with a high degree of exactness, and the manufacturers state that any desired modulation of heat output can be secured without altering the supply of heat to the unit. The radiator can be full of steam at high temperature, but, with the damper entirely closed, the heat input to the room will be practically zero. Insulation of the casing prevents heat loss to outside walls.

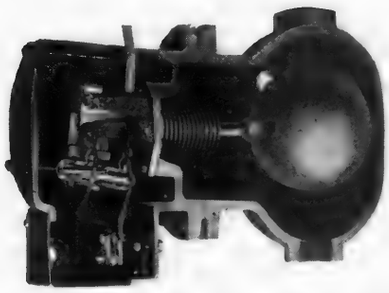
Circular units are built in uniform thickness of 3⅜ in., and in lengths, varying in 6-in. steps, from 12 in. to 48 in. The weights, in pounds, are, in each case, 6 more than the length, in inches. Special sizes are built for the bathrooms and other specific installations. An elaborate catalog has been prepared, covering in detail the features of Circulair.

Room in Children's Hospital, Showing Unobtrusive Installation of Circulair

Low-Water Oil-Burner Cut-off

An interesting production for shutting off an oil burner when the boiler water-line gets low, is being marketed by McDonnell & Miller, Chicago, Ill., under the name of the McDonnell & Miller water cut-off for oil-fired steam boilers. This appliance has but two parts in the water space of the instrument, namely, the float and the sylphon bellows, the latter permitting the transfer of the float power to the movement of the switch without the use of a stuffing box.

It is designed for quick installation in



McDonnell & Miller Low-Water Cut-off for Oil Burner

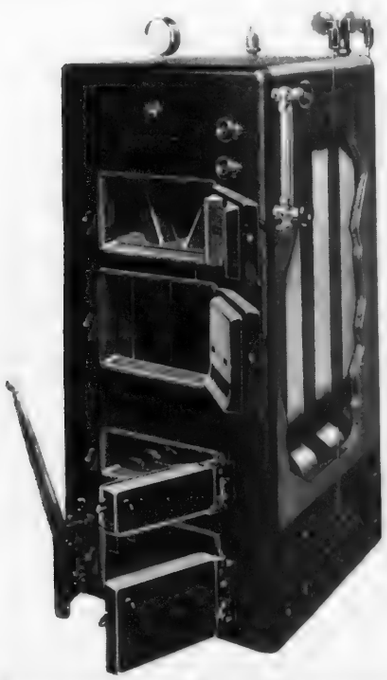
the gauge glass tappings. The mercury switch in the instrument, it is pointed out, will carry the full line current for 1 1/2 H.P. motors, working on either A.C. or D.C. current.

Where desired, an alarm feature may be added to notify the boiler room attendant whenever the instrument stops the burner on account of low water in the boiler.

The device is made in two types, one for boiler pressures up to 25 lbs. and the other for boiler pressures up to 100 lbs. Each type is furnished for manual resetting or with automatic cut-in.

A Metal-Covered Porcelain-Enamel-Finished Boiler

Many unique features are embodied in the new Ideal sectional boiler, announced by the American Radiator Company and described as the first completely-equipped metal-covered porcelain-enamel-finished boiler to be marketed at populuar prices. The equipment includes mechanical regulation and all the usual accessories. Among the notable features of this boiler are its porcelain-enamel-finished doors, its special grates, permitting the use of small-sized coal, its jackets of indestructible sheet steel, its air-cell asbestos insulation, its side metal jackets and finish with red baked enamel. Particular interest is attached to the grates, which are of triangular-top construction, providing for the grinding of clinkers when the grates are shaken. The boiler is made in six sizes with steam ratings from 350 to 1100 sq. ft. and corresponding water ratings.



Porcelain-Enamel Finish Characterizes New Ideal Sectional Boiler

A Desk Fan With Novel Features

An unusual type of desk fan, designed to give adequate air circulation without disturbing the papers on one's desk, has been developed by the De Bothezat Impeller Co., 1922 Park Ave., New York, and is sold under the name of Cooling Beauty. This unit draws air from top and bottom at low velocity and blows it out at a higher velocity in all directions radiating from the fan. Its characteristic feature is that it maintains a lateral movement of air rather than a downward flow which makes the unit particularly adaptable to restaurants, as well as to offices, as one of the difficulties ordinarily encountered in restaurants is the rapid cooling of the food.

Novel Design of De Bothezat Desk Fan

Dixie Ceiling-Type Unit Heater

Producing a constantly recirculating flow of warm air that reaches all parts of the room is the function of the Dixie unit heater, manufactured by the Dixie Co., Hammond, Ind. Weighing only 115 lbs., the heater is supported directly from the supply lines. It can be suspended 10 ft. to 12 ft. above the floor, and from this height, it is stated, that 2600 cu. ft. of air per minute is forced directly to the floor. Seamless copper tubes are individually connected, both top and bottom into a one-piece header, without the use of solder or brazing. The core is 3 in. thick, and consists of four rows of tubes so arranged that no air passes through the core without thoroughly being heated. These cores are tested to 200 lbs. hydrostatic pressure, while for higher pressures up to 200 lbs. a special core with other headers is manufactured. Furnished with 5 lbs. of steam pressure the standard heater is stated to transfer approximately 218,250 B.T.U. at 50° F. room temperature.

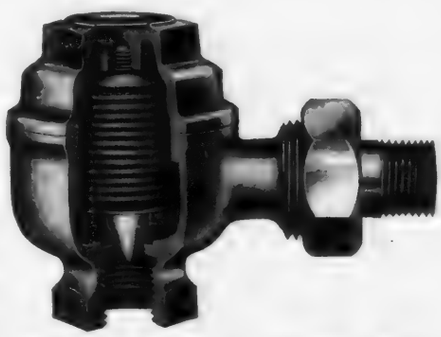
New Form of Ventura Disc Fan

The Ventura disc ventilating fan is now furnished, in the smaller sizes, with a square pressed steel plate instead of the circular frame formerly provided and still used on the larger fans, it is announced by the American Blower Company, Detroit, Mich. This square plate makes it unnecessary for the contractor to build a frame with a round opening.

In their peculiar dip or curve, the blades of the Ventura fan, ten in number, and slightly overlapping, resemble the blades of an aeroplane propeller. They are riveted to a large central disc to prevent back flow of air through the center when working against pressure. On the larger sizes a stiffening ring is placed around the edge of the blade for added strength.

Thermoflex—A New Radiator and Drip Trap

As the result of twenty years' experience in the design and manufacture of thermostatic traps for vacuum and vapor systems, W. D. Cashin Company, Boston, Mass., has produced a radiator and drip trap, known as the No. 3. The essential feature, and only moving part, of this drip trap is a thermostatic element comprising a hydron metallic bellows, with a screw-thread on one end and a conical valve point on the other. These bellows are made as precision instruments, and are formed by hydraulic pressure in such a way that any movement is equally distributed between the required number of convolutions. The



Thermoflex Radiator and Drip Trap

formation of the bellows is accomplished without spinning or rubbing action, which might damage the structure or alter the essential characteristics of the tubes. The traps are made in several sizes and capacities to fit any normal requirement.

Enflo Diffusers

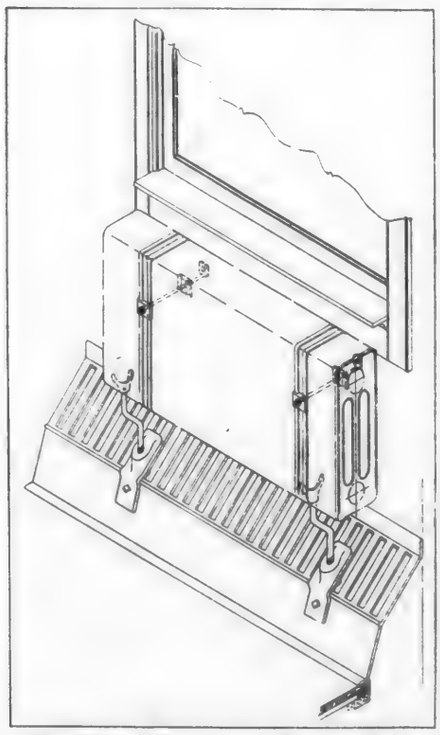
Designed specifically to permit the introduction of a large volume of air along the floor line without setting up noticeable drafts, the Enflo diffuser has been placed upon the market by the Ventilating Products Co., 2800 Cottage Grove Ave., Chicago.

These diffusers are placed at the ends of rows of seats in theaters, the air jet being projected along the axis of the row, so that direct blast upon the feet of the audience is avoided. Regulation of the air flow is accomplished by means of a single screw, recessed in the centre of the top and readily accessible. There are no toggle joints or movable parts to rattle. Enflo diffusers are made of cast-iron with black japan finish.

Samuel R. Lewis Designs a Ventilating Baseboard

A cast-iron baseboard, particularly for use in connection with schoolhouse ventilation, has been designed by Samuel R. Lewis, of Chicago. It is arranged to receive air from a duct below the floor or from between the joists, and to divert it upward at a rather high velocity through an injector-shaped orifice, so as to bring about some whirling of the air in the room.

Provision is made for the adjustable support of radiators above this hollow baseboard so that the air may be heated by the radiator. This arrangement also has the effect of greatly increasing the heat convection from the radiator by means of a long narrow orifice which is designed to extend the entire length of the ordinary classroom, the distribution of fresh air being increased accordingly.



Ventilating Baseboard, Designed by Samuel R. Lewis

Another feature of the baseboard construction is that the down draft, due to the wall chill, is neutralized. Where the air is brought across the room between the joists, the floor will always be dry and at least comfortably warm. Due to the vertical air delivery, there is little danger of drafts striking the occupants. The grilles are described as sanitary, since they are above the floor and so narrow that they do not form foot rests of seats.

These baseboards, states Mr. Lewis, have been used in several school and similar buildings of considerable size and are in active demand.

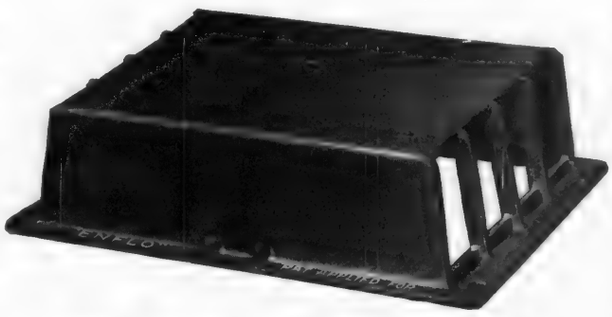
American Radiator's New Copper Blast Unit

In connection with last month's announcement that the American Radiator Company had placed on the market a new copper blast unit with cast-iron headers, known as Arcoblast, it is announced that the company's sales policy will be to market these units only to unit heater manufacturers for use in unit heater construction. The Arcoblast is not to be sold for central fan or plenum chamber work.

At the present time, five unit heater manufacturers are using Arcoblast exclusively, namely: Bishop & Babcock Company, Autovent Fan & Blower Company, Clarage Fan Company, New York Blower Company, and Johnson Fan & Blower Company.

Cast-iron is used for the headers as it holds the heat and takes longer to chill. For that reason it is easily susceptible to thermostatic control. The cast-iron tube plate is ¾ in. thick, and is readily fastened, using an inside expanded ferrule. The ferrule gives an orifice in the tubes of ⅝ in., making the tube space ample for the flow of condensation.

By making the cast-iron header V-shaped, steam enters all the tubes at the same time and thereby equalizes expansion and contraction.



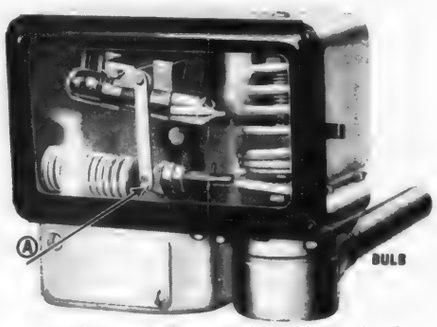
Enflo Diffusers Admit Large Volume of Air Without Drafts

As described in last month's issue, copper tubes ¾ in. in diameter are finwound with copper ⅜ in. copper strips and are then expanded into the cast-iron headers. The tubes are staggered and the extended surface is made an integral part of the tubes. Each header is composed of two flanged elements, one being the tube sheet into which the tubes are expanded. The tube sheets, with the tapered cast-iron header bodies, flange connected, form the supply and return headers.

A catalog just issued by the company presents data covering roughing-in dimensions, physical characteristics, friction tables, final temperatures, condensation and pipe sizes.

Dunham Boilerstat Controls Vacuum Pump

Designed for use in conjunction with the Type DH pump in the Dunham differential-vacuum steam heating system, the Boilerstat, an automatic electric switch, manufactured by the C. A. Dunham Co., Chicago, Ill., is installed with its thermostatic bulb member extending through a hole in the boiler shell, and its electric circuit in series with the pump.



Dunham Boilerstat for Control of Vacuum Pump

This switch, through the tilting of a mercury tube, makes an electric contact when the boiler water reaches a temperature of 120° and breaks that contact when the temperature falls to 115°. It is used automatically to open the circuit, stopping the pump when its operation would not be required.

FEDERAL FERO NEW-TYPE RADIATORS are announced by the Kellogg-Mackay Co., Chicago, in a newly-issued catalog. These units, it is stated, were designed to meet the three paramount considerations in radiator designs, namely, increased efficiency (obtained by decreasing the water content and increasing the ratio of air space to radiation area), small space requirements, greater grace and beauty of line and proportion

New Trade Publications

SIMPLEX SAVINGS is the title of a little folder issued by Simplex Heat Regulator Co., Minneapolis, Minn. In it is described and pictured a series of thermostatic heat regulators and safety devices operating boiler and furnace drafts and checks, through the medium of either spring or weight-operated

Simplex Electric Motor for Operation of Heat-Control Appliances

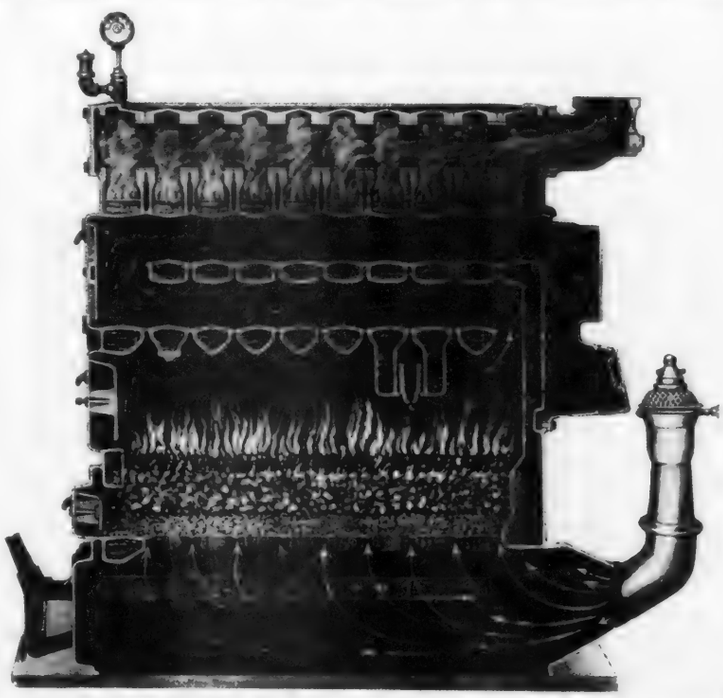
motors. One-day clocks are used with the thermostats, which may be had for continuous operation at a designated point, or for functioning at different day and night temperatures. The former type can be used where low night temperature is desired, the low setting being manually made each night. The series includes a pressurestat, a hydrostat and a furnacestat. A separate folder announces, as a new instrument, a Simplex electric motor to be connected directly to the house lighting circuit, and to operate draft and check.

COPPUS UNDER-GRATE DRAFT BLOWERS are featured in a catalog issued by the International Fuel Service Corp., Bridgeport, Conn., distributors for the United States and Canada. This equipment is designed for use with boilers small enough for use in houses of average size, as well as in apartment houses, public buildings and schools. It is built in four sizes, the two smallest having centrifugal fans and the two largest being equipped with Vano turbine blowers. The former type will handle heating plants where coal up to 20 tons per season is burned; the latter pair are rated at 50 tons and 250 tons per season, respectively. The Vano blowers are built as vertical units, with a 45° elbow bolting to the ash-pit of the boiler. The vertical G-3 motor has turbine-type blades at the lower end of the shaft, which is carried in ball bearings. The air intake is screened to prevent the entry of dirt. Lubrication attention is required only three times during a heating season. Coppus temperature or pressure regulators automatically control the motor operation. Used with small sizes of anthracite, it is said that highly satisfactory operation can be secured and material economies effected.

VAPOR HEATING SPECIFICATIONS FOR ARCHITECTS are found in a folder issued by the Vapor Heating Co., York, Pa., manufacturers of specialties required by the Broomell system. A second folder contains formulae for calculating radiation and data for selecting the proper equipment for any job. These folders are provided in 8½ in. x 11 in. size, for filing under A. I. A. rules.

GARY GAS BOILERS AND BURNERS are described in literature received from The Gary Gas Burner Co., Duluth, Minn. The boiler is of the circular, cast-iron, sectional type, resembling a conventional round-type coal-burning boiler, except that the base section is reduced in diameter below what would be the grate line. The crown section and such additional sections as may be used above it are corrugated to increase the surfaces. The Gary gas burner is built in three types, one for use in the Gary boiler and the others for conversion jobs in boilers or warm-air furnaces.

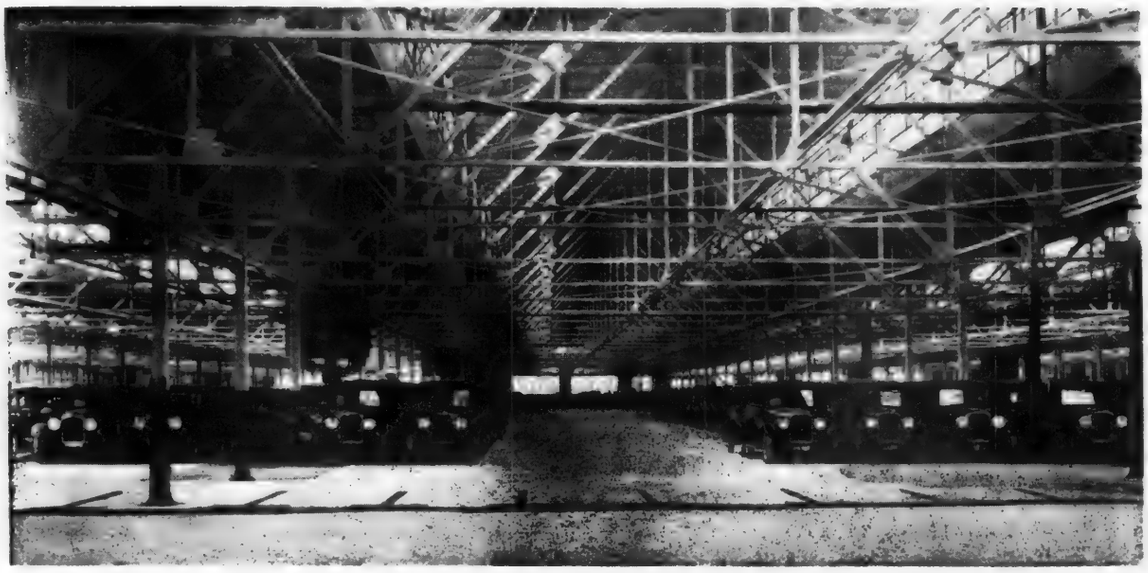
Separate Castings of Gary Gas-Fired Boiler, Showing Corrugations



Sectional View of Boiler With Coppus Under-Grate Draft Blower Installed

HEAT INSULATION FOR HOUSES is the title of an elaborate publication issued by Flax-li-num Insulating Co., St. Paul, Minn. This bulletin begins with an outline of the function of house insulating materials and then briefly sketches the development of Flax-li-num, its source and structure and the methods of application. The measurement of heat transfer and the theory of heat losses from buildings are well presented. The determination of transmission coefficients is treated in detail and a great many of the technical data in the bulletin follow verbatim those published in THE HEATING AND VENTILATING MAGAZINE for March, 1925. Tabulations are given showing methods of determining the actual net fuel saving on different houses of the bungalow and multi-story type. The latter half of the bulletin is devoted to an elaborate story of how Flax-li-num should be applied, both for heat insulation and sound deadening. A comprehensive double-page graph is inserted at the end of the booklet, from which correct radiation can be determined for insulated homes. Size 8½ in. x 11 in. Pp. 64.

THE VENTURAFIN IN THE MAMMOTH NEW OAKLAND-PONTIAC PLANT is the title of a bulletin issued by American Blower Co., Detroit, Mich., describing heating equipment in what is stated to



Venturafin Ceiling-Type Unit Heaters in Car Storage Building, 432 Ft. by 762 Ft., Oakland-Pontiac Plant

be the largest factory built in the United States during 1926. This plant has a capacity of 1000 cars per day and has a volume of 35,000,000 cu. ft. with a floor area of 35 acres. This publication is an interesting illustrated story of the features of this building, laying particular emphasis upon the heating requirements and the equipment used. There is more than a mile of skylight, containing over 500,000 sq. ft. of glass, and the total heat-loss is 111,000,000 B. T. U. per hour. Venturafin units were decided upon for this job and they are said to have entirely fulfilled the expectations of the engineers. The story of the Oakland-Pontiac plant is followed with several pages of detailed information regarding Venturafin units. Size 8½ in. x 11 in. Pp. 16.

ANDES RE-CONDITIONING SUPER HEATER, devoted to the Andes system of warm-air heating, embodying humidifying equipment, an Electrozone system and an electric fan for maintaining positive air circulation, is illustrated and described in a comprehensive catalog issued by the Andes Range and Furnace Corp., Geneva, N. Y. Provision is made for recirculating the air through the Electrozone attachment. The humidifying equipment, it is stated, is capable of evaporating as much as 12 gal. of water per day. The radiator shield, which is a part of the heater, is described as a new development. It is designed to hold all heat inside the heating chamber so that the air passing both sides of the shield may absorb as much heat as possible from the large surfaces. Size 6 in. x 9 in. Pp. 24.

MCKEESPORT RADIATOR typical of the new-style radiation on the market, is the subject of a folder issued by the Columbia Radiator Co., McKeesport, Pa. The folder states that the three, four and five-tube radiators are in active production, while the seven tube, 23-in. in height, is now being manufactured. The folder presents full data for each type, the figures in each case covering the heating surface of the radiators in square feet.

NATIONAL MOISTAT CONTROLS AND RECORDER-CONTROLLERS are featured in a folder that will interest those using dry kilns. This specialized equipment is manufactured by The National Dry Kiln Co., Indianapolis, Ind. The Moistat system controls temperature and humidity and, by the alternate application of moisture and dry heat, it is said to condition lumber in a minimum time. The design of this equipment was the result of war-time endeavors to speed up the passage of lumber through the kilns. At this time it was found that the use of moist air was decidedly advantageous in drying lumber. This equipment controls and records both the temperature and humidity conditions, and its use is said to materially reduce the maintenance of wood-working machinery through which properly conditioned lumber is passed.

A COMPLETE LINE OF HEATING ACCESSORIES is the title of a sales manual just issued by the American Radiator Company. A feature of the manual is the graphic demonstration of several of the Accessories Division products in a way that explains very clearly their construction and operation. The primary object of the manual is to enable the salesman to hold to the continuity of his story regardless of those distractions which naturally occur in the normal sales approach. The products described include Airid air valves, Vac-Airid vacuum valves, Ideal quick vent, Ideal air line valve, Ideal Vento vent, Ideal float quick vent, Ideal Vac-vent, Arco packless valves, Arco water regulator, Arco junior water regulator, Arco steam regulator, Detroit equalizing valves, Detroit radiator valves, Arco snapacting gas valve, Mercoid controls and Excelso water heaters.

ARE YOU LIVING IN COMFORT? is the caption of an attractive booklet being circulated by the Security Stove & Mfg. Co., Kansas City, Mo. In it is a description of the Security automatic oil-burner, a direct distillation, mechanical-draft type, designed to burn distillates of the furnace-oil class. Three styles of burners are described; a high-low burner for use where gas for ignition is not available; an intermittent burner with gas pilot; a combination gas-oil burner, in which either gas or oil can be burned with no change but the throwing of a switch and turning of a valve. Either of the intermittent types may be had with a double annular blast tube, the outer tube serving to supply the blower with products of combustion, taken from the combustion chamber, with the result that combustion is retarded and rendered less noisy. The Security burner is designed for boilers from 18 in. to 36 in. diameter, and to handle ratings up to 1000 sq. ft. of steam radiation. The catalog is an excellent example of its kind and quite accurate from a technical standpoint. Size 5 in. x 9 in. Pp. 24.

Through error the address of the National System of Hot Blast Heating appeared in the November issue as 4146 South Wabash Avenue, whereas the correct address is 4146 South Western Avenue, Chicago.

Electrozone Equipment

In a recent review in these columns of a catolog of the products of the Air Conditioning and Engineering Co., St. Louis, Mo., entitled "Pure Air and Pure Water by Scientific Methods," the statement was made that electrozone products are manufactured by the Electrozone Corporation, of New York. The catalog in question bore the imprint of the Electrozone Corporation of New York, which, however, is the eastern sales representative for the Air Conditioning and Engineering Co., St. Louis.

Oil Burners for Large Low-Pressure Heating Plants

Johnson Rotary. *Revolving-Cup Atomizing, Manual or Full Automatic Control*

Previous articles in this series are:

1. *Todd*, August, 1927.
2. *W. N. Best*, September, 1927.
3. *Ballard*, October, 1927.
4. *Ray*, November, 1927.

5. Johnson Rotary

THE first of an extensive line of oil burners manufactured by the S. T. Johnson Co., Oakland, Cal., was brought out in 1905, and since that time this organization has amplified and spread out to provide for national distribution of oil burners for industrial, commercial, domestic and process work.

During 1915 the Johnson Rotary, a burner designed to burn the lower grades of fuel oil under heating boilers, was produced. The improved burner with many important features is known as the Type 22 with manual ignition, and Type 26-A for full automatic control.

Important factors considered in the design of the rotary burner were: Ability to burn the heavy fuels; means for insuring the proper ratio of oil and air at all times; minimum service requirements; compactness and accessibility.

Several exclusive features also are incorporated in the burner. The oil pump is an integral part of the machine on the pump-type burner. A special grooved spider drives the spinner cup, insuring a positive feed of fuel to the cup periphery. Primary air for atomizing purposes is drawn around the motor casing, keeping it at a low temperature at all times. The worm used in driving the oil pump is integral with the burner shaft, producing a quiet operating burner. A heavy copper tube of ample capacity delivers oil to the spinner cup at minimum pressure.

THE BURNER

Rotary burners are driven by 3450 R. P.M. alternating or direct current motors. The worm used in driving the oil pump is mounted at each end for ball bearings. The motor rotor closely overhangs the rear bearing, the fan and atomizing cup overhanging the front bearing. This assembly is balanced scientifically to produce a non-vibrating and quiet running burner. Low-pressure air is delivered by the fan to the nozzle surrounding the atomizing cup to further break up the fine spray of oil leaving the cup periphery. This air supply is controlled accurately to suit the demands of the fire. The burner front plate is rigidly mounted to the boiler front, a swing-joint being used to permit the burner to swing out of firing position for inspection.

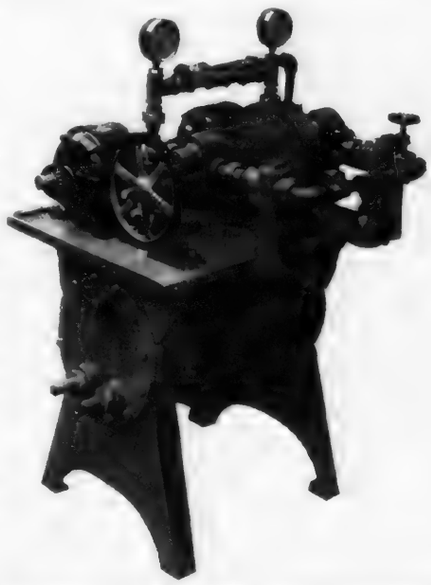
CAPACITY

Both manual control and full automatic burners are built in five sizes, covering a range of from 350 to 20,000 sq. ft. of steam radiation or its equivalent. Capacities as given below are catalog ratings, the flexibility of the burners permitting an overlapping of these capacities.

Type	No.	H. P. Motor	Sq. Ft. Steam Rating
22 or 26-A	1½	1/4	350-600
"	2½	1/3	600-2000
"	3½	1/2	2000-5000
"	4½	3/4	5000-10,000
"	5½	2	10,000-20,000

PUMP-TYPE BURNER

When one or two burners only are installed, burners having gear pumps attached are used. The oil pump is driven by reduction gearing. Pump gears of ample size and running at a minimum speed are closely fitted in the pump body. This feature makes servicing of the pump practically negligible.



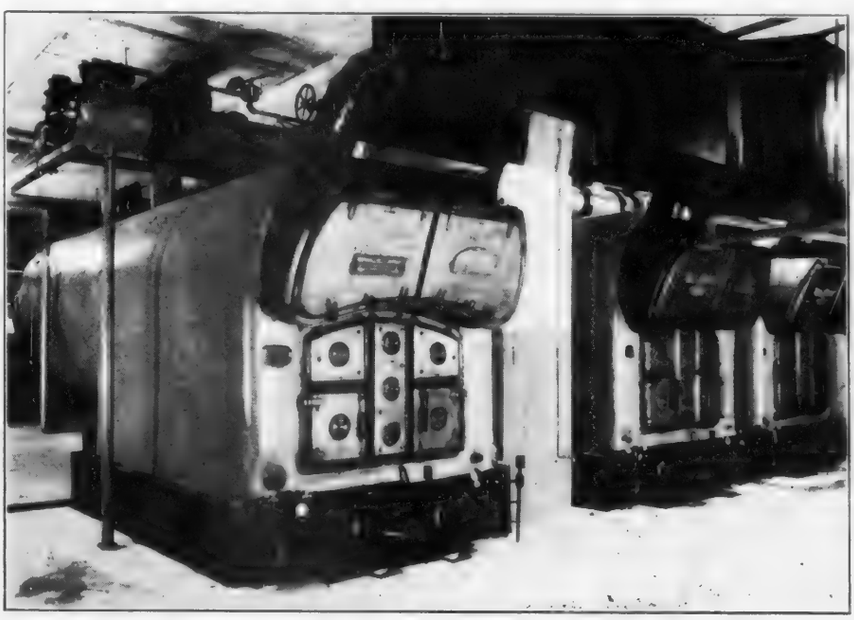
Duplicate Oil Pumping and Preheating Equipment

One chain guard removed to show silent chain drive.

The piping is so arranged that oil not used by the burner is returned to the tank. A constant back-pressure to the burner is maintained by a relief valve. Oil pressure of from 2 to 10 lbs. is ordinarily used, except with exceptionally viscous fuel. Electric, steam, or hot-water heaters are supplied in the feed line to preheat heavy oil and insure complete atomization.

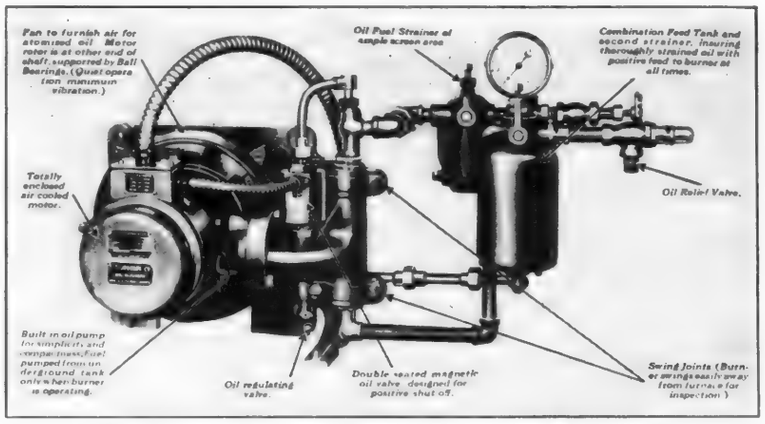
BURNERS WITHOUT PUMPS ATTACHED

All five sizes of manual-ignition burners are built for use with a separate oil-pumping system. When several burners are used and it is necessary to preheat



Boiler Room, Frank Wiggins Trade School, Los Angeles, Calif.

Three 30,000 sq. ft. Oil City boilers, each fired with two Johnson rotary oil burners, rated at 20,0000 sq. ft. O. W. Ott, Los Angeles, heating engineer.


Fan to furnish air for atomized oil. Motor rotor is at other end of shaft, supported by Ball Bearings. (Quiet operation maximum vibration.)
Oil Fuel Strainer of ample screen area
Combination Feed Tank and second strainer, insuring thoroughly strained oil with positive feed to burner at all times.
Totally enclosed air cooled motor.
Oil Relief Valve.
Built in oil pump for simplicity and compactness. Fuel pumped from underground tank only when burner is operating.
Oil regulating valve.
Double seated magnetic oil valve designed for positive shut off.
Swing Joints (Burner swings easily away from furnace for inspection)

Johnson Type 26-A Full Automatic Oil Burner

the oil, a material saving in initial cost is made by installing either a single or duplicate pumping equipment. The duplicate pump unit is mounted over a coil-type oil heater, each pump so connected that either or both pumps may be run. A circulating piping system can be installed so that only the oil used by the burners is preheated.

FURNACE BRICKING

Standard practice is followed in bricking the firebox except that the secondary air for combustion is taken through ports in the furnace floor arranged to conform to the contour of the flame.

It is often recommended to raise the boiler, or pit the furnace floor to secure the desired furnace volume. Various combinations of atomizing cups and primary-air nozzles are supplied to produce a flame best suited to the shape of firebox. The viscosity of the fuel is also considered in determining the correct combination of air nozzle and oil atomizer.

SEMI-AUTOMATIC CONTROL

The manually-ignited Type 22 burner is supplied with an arrangement to synchronously control the oil and air supply to the burner. Adjustments are provided to secure the correct proportion of air and oil for the intensity of flame. This combination air and oil control is operated by the boiler sylphon and when properly adjusted will maintain an even pressure in the boiler.

FULL AUTOMATIC CONTROL

Full-automatic Type 26-A burners are supplied only with pumps attached, suction and return lines being run from the oil storage-tank to the burner fittings. The burner is fitted with a check valve, suction and feed-line strainer, magnetic shut-off valve, pressure gauge and relief valve.

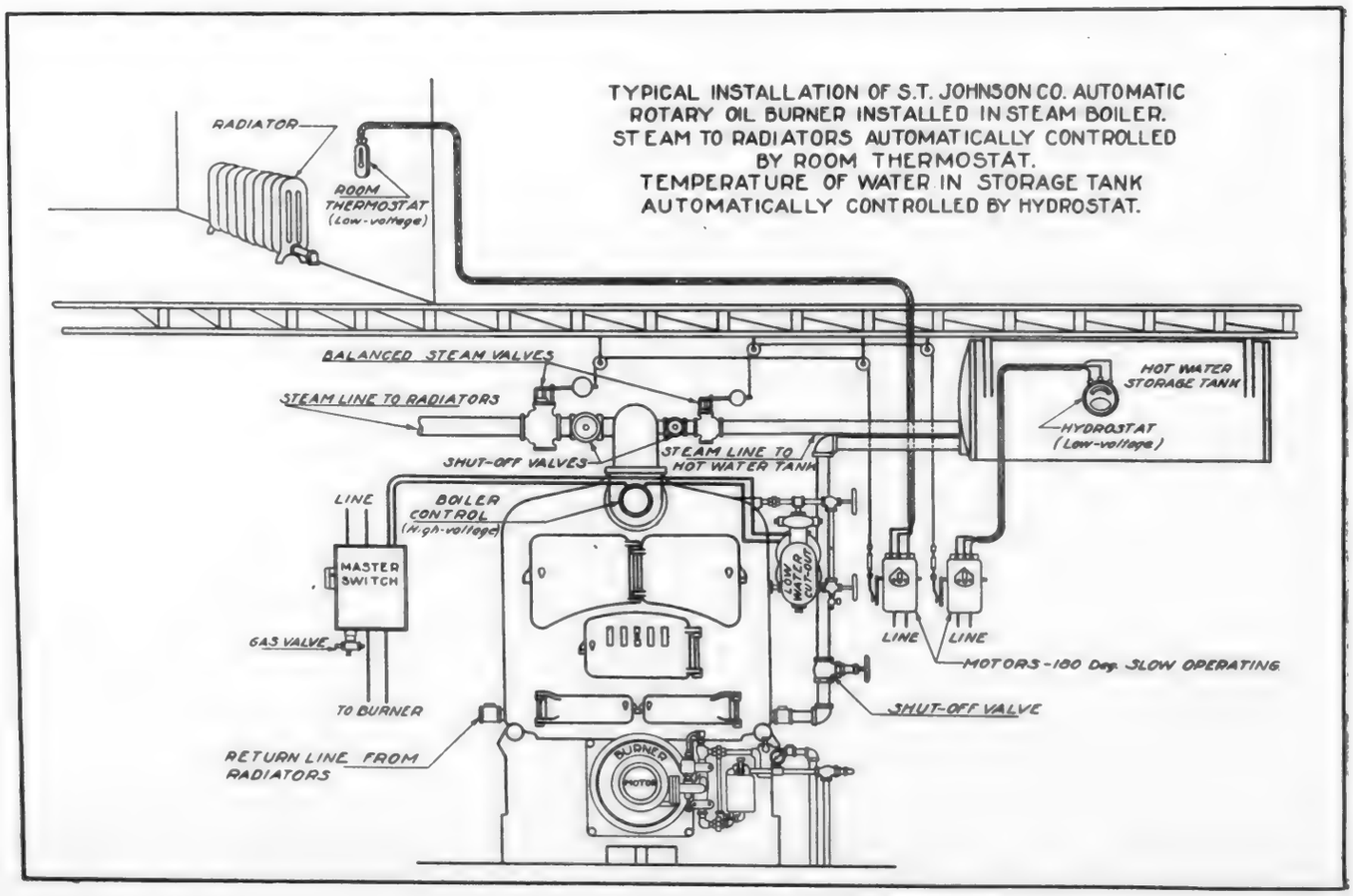
Automatic controls of a type best adapted to the installation are supplied. Ordinarily, room and boiler thermostats of the high-voltage type are used, but when desired, low-voltage instruments, including either plain or clock-type room thermostat may be installed. Another automatic control system that has found favor in West Coast territory is shown in the accompanying illustration.

The Johnson master switch used to control the burner employs a closed series circuit. Should any part of the circuit fail, the burner will not be permitted to operate. Lack of oil or failure of ignition will positively shut down the burner until the difficulty has been corrected.

ENGINEERING SERVICE

Factory branch offices or authorized dealers are located throughout the country. Prior to accepting orders each installation is analyzed from an engineering standpoint and the most suitable equipment recommended. Realizing the intimate relation of burner, controls, furnace and boiler, the S. T. Johnson Company distributors refer intricate control problems and installations presenting peculiar features direct to the factory engineering department.

Both Type 22 and Type 26-A burners are listed in the Underwriters' Laboratories Label Service.


TYPICAL INSTALLATION OF S.T. JOHNSON CO. AUTOMATIC ROTARY OIL BURNER INSTALLED IN STEAM BOILER. STEAM TO RADIATORS AUTOMATICALLY CONTROLLED BY ROOM THERMOSTAT. TEMPERATURE OF WATER IN STORAGE TANK AUTOMATICALLY CONTROLLED BY HYDROSTAT.
RADIATOR
ROOM THERMOSTAT (Low-voltage)
BALANCED STEAM VALVES
STEAM LINE TO RADIATORS
HOT WATER STORAGE TANK
HYDROSTAT (Low-voltage)
SHUT-OFF VALVES
STEAM LINE TO HOT WATER TANK
LINE
BOILER CONTROL (High-voltage)
MASTER SWITCH
GAS VALVE
TO BURNER
RETURN LINE FROM RADIATORS
LINE
LINE
MOTORS-180 Deg. SLOW OPERATING
SHUT-OFF VALVE
BURNER MOTOR

F. T. JOY, VICE PRESIDENT
W. E. MALLORY, TREASURER

C. A. MALLORY, PRESIDENT

H. B. MALLORY, VICE PRESIDENT
T. J. BOWEN, SECRETARY

RENOWNED SINCE 1823

THE MALLORY HAT CO.

FUR FELT & STRAW HATS

NEW YORK SALESROOM 234 FIFTH AVE. COR. W. 27TH ST

MAIN OFFICE AND FACTORY
DANBURY, CONN.

February 8, 1926.

The Powers Regulator Company,
2720 Greenview Avenue,
Chicago, Illinois.

Gentlemen:-

Replying to your letter of February 1st regarding our experience with your automatic temperature control, since our original installation in 1919 we have added several units in different parts of our plant; our main building is completely equipped.

We consider the investment in this apparatus profitable for the following reasons: Fuel saving amounts to over 20 per cent; and Efficiency of workmen has been increased owing to air condition being much better for their health and comfort.

Your apparatus has also been a great help to us in maintaining proper temperature and humidity in our blowing and forming mill.

Although we have tried several other makes of automatic temperature control, we have found none so accurate and dependable as yours.

Very truly yours,
THE MALLORY HAT COMPANY
H. B. Mallory.

HBM:be

ORDERS ACCEPTED SUBJECT TO FIRES, STRIKES, ACCIDENTS OR OTHER CAUSES BEYOND OUR CONTROL DELAYING OR PREVENTING DELIVERIES

THE POWERS REGULATOR CO.

36 years of specialization in temperature control

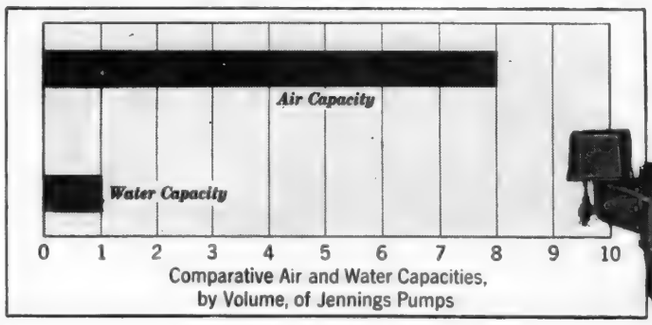
2718 Greenview Avenue, Chicago

Atlanta, Baltimore, Boston, Buffalo, Butte, Mont., Charlotte, N. C., Cincinnati, Cleveland, Denver, Des Moines, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, Nashville, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Rochester, St. Louis, Salt Lake City, San Francisco, Seattle

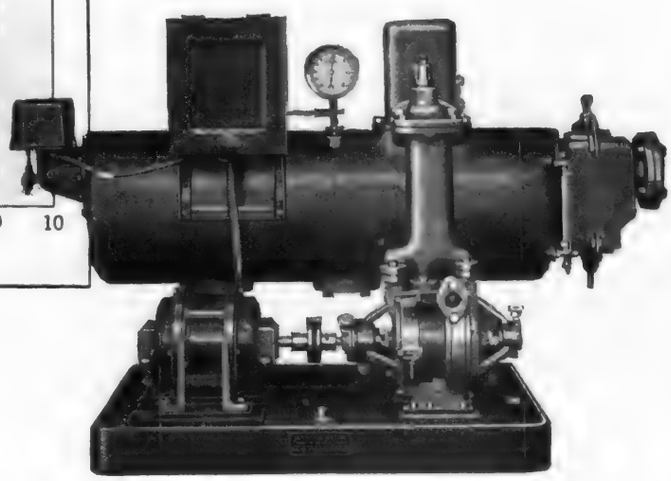
CANADIAN OFFICES

Toronto, Montreal, Halifax, Winnipeg, Calgary, Vancouver

(3587)



Comparative Air and Water Capacities, by Volume, of Jennings Pumps



Air capacity *proportioned* to radiation

A Jennings Return Line Vacuum Pump consists of an air unit and a water unit, mounted on the same shaft and combined in a single casing.

That is, there are two separate units for handling air and water. ***An opportunity is thus provided to proportion air capacity,*** as well as water capacity, ***to the radiation to be served.*** This is done in the Jennings design. Air capacity is made eight times larger than the volume of condensate—a proportion that has worked out well in practice.

For a given installation, the quantity of condensate is known. If this is reduced to cu. ft. per min., and this amount multiplied by eight, the result is the air capacity, in cu. ft. per min., of the Jennings Pump that is recommended for the radiation.

NASH ENGINEERING COMPANY

81 Wilson Road SO. NORWALK, CONN.

Jennings Pumps

Trade and Miscellaneous Notes

Coming Events

December 5-9, 1927. Annual meeting of the American Society of Mechanical Engineers in New York. Headquarters at the Societies' Building, 29 West 39th Street.

December 5-10, 1927. Sixth National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

January 23-26, 1928. Annual meeting of the American Society of Heating and Ventilating Engineers in New York. Headquarters at the Hotel Pennsylvania.

January 23-27, 1928. Ninth annual convention of the Associated General Contractors of America in West Baden, Ind. Headquarters at the West Baden Springs Hotel.

February 21-28, 1928. Tenth annual "Own-Your-Home" Building and Equipment Exposition in New York. Headquarters at Madison Square Garden.

March 31-April 7, 1928. Eighth annual "Own-Your-Home" Building and Equipment Exposition in Chicago. Headquarters at the Coliseum.

April 3-5, 1928. Fifth annual convention of the American Oil Burner Association in Chicago. Headquarters at the Stevens Hotel.

Miscellaneous Notes

Greater New York Oil Heating Association held a meeting at the Hotel Empire, New York, October 6, with 50 dealers and representatives in attendance. Considerable discussion arose over the necessity for support from the industry in the attempt of the association to secure revision of the New York City fuel oil rules. President F. F. Lewis appointed a publicity and membership committee to carry out the program for support.

Central Supply Association held its 33rd annual meeting at the Palmer House, Chicago, October 26-27, at which the following officers were elected: President, Fred N. Kretschmer, Iowa; first vice-president, Charles K. Foster, Illinois; second vice-president, Fred W. Swanson, Iowa; delegate to Trade Extension Bureau, Walter J. Kohler, Wisconsin. The keynote of the meeting was the need of standardization and simplification methods and better cost accounting systems.

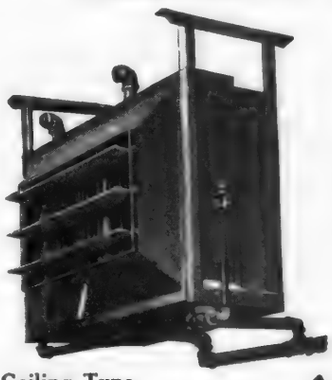
Among the speakers at the meeting were Russell G. Creviston, secretary of the T.E.B. Program and Budget Committee, who delivered a talk on trade problems and pointed out that one effective way of combating ruinous competition is through the medium of group advertising on a national scale such as that formulated by the National Trade Extension Bureau; Prof. Malcolm P. McNair, assistant director of the Bureau of Business Research, Harvard University, delivered an address on "Analyzing Wholesale Distribution Costs." With the aid of charts, Professor McNair discussed such fixed expense in cost distribution as rent, taxes on real estate, insurance, liability, credit, taxes other than real estate, variable expenses, operating expenses, etc. Secretary W. E. McCollum delivered a talk on better cost accounting for the wholesaler. Hon. Clyde Kelly, co-author of the Kelly-Capper Bill, urged the passage of the proposed resale legislation which is calculated to eliminate the evils of price-cutting on trademarked commodities.

As a token of appreciation of his service to the organization, William B. Bryar, past president, was presented with a gold watch.

National Trade Extension Bureau, Evansville, Ind., announces that the next annual conference of association presidents and secretaries will be held at the Schenley Hotel, Pittsburgh, Pa., January 9, 10, and 11, 1928.

Not One—in FOUR years

has ever failed to give SATISFACTION!



Ceiling Type

Every Autovent Unit Heater built is still giving 100% service. No trouble of any kind has ever been reported.

Correct design plus the best obtainable materials is the reason. There is nothing "flimsy" about an Autovent Unit Heater. It is constructed to give years and years of service with minimum attention.

It has these features. Heavy-duty motor—tapered discharge — adjustable diffusers — extra large air-pressure chamber. For lasting satisfaction install

AUTOVENT UNIT HEATERS

Manufactured & Guaranteed by

Autovent Fan & Blower Co., 1805-27 N. Kostner Ave. CHICAGO

Don't hesitate about figuring Unit Heater jobs. Remember that we have a staff of engineers constantly at your service. Write to us for ideas and suggestions— no obligation.

The Copper and Brass Research Association at its seventh annual meeting, held in New York October 20, elected the following to its board of directors: John A. Coe, president of the American Brass Company; F. S. Chase, president of the Chase Brass & Copper Company, Inc.; Barton Haselton, president and general manager of Rome Brass & Copper Company; Carl F. Dietz, president of the Bridgeport Brass Company, and E. O. Goss, president of Scovill Mfg. Company. Messrs. Coe, Chase and Haselton were elected members of the executive committee, following the meeting of the board of directors.

It was anounced that R. L. Agassiz had been elected president; C. F. Kelley, F. S. Chase, Walter Douglas and Barton Haselton, vice-presidents; Stephen Birch, treasurer, and H. H. R. Spofford re-elected as secretary.

The directors re-elected William A. Willis as manager of the association, a position he has held since the association's organization.

October construction volume breaks records, according to the monthly report of the F. W. Dodge Corporation, new construction started during the month being nearly $563,000,000. This was the highest October contract total on record, being 8% ahead of September of this year and 9% in excess of the total for October of last year.

Of this peak figure, more than a quarter of a billion dollars, or 43% of all construction, is for residential buildings; 19% of the total for public works and utilities; 14% for commercial buildings; 9% for industrial projects, and 5% for educational buildings. The total for the year to November 1 is approximately $3,000,000 in excess of the total for the corresponding period of 1926.

Even in the New York section, the percentage of total expenditures for residences was high—42%. It is interesting to note that of the $37,000,000 to be expended for public works and utilities, $20,000,000 was awarded in a single contract.

Contracts let during October for new construction in the central west amounted to nearly $200,000,000, the highest October total yet recorded and the second largest monthly total ever recorded in the central west. The proportion of October contracts for residential buildings in this territory is almost exactly the same as it is for the entire country.

Chicago's Eighth Annual Own-Your-Home Building and Equipment Exposition will be held in the Coliseum, March 31-April 7, 1928, it is announced by Robert H. Sexton, managing director. Nearly 200 manufacturers and builders will have booths. The Coliseum will be transformed into an old-time village green, around which will be located the front and side elevations of houses to be erected to teach home-owners the proper methods of construction. Each day at the exposition will be designated as a special day to study the seven steps in home building in the order of their importance: Planning the home; selecting the home site; financing the home; building the house; mechanical and other equipment; decorating and furnishing and landscaping the ground.

Fiftieth Anniversary of American District Steam Company

Fifty years of service in the district heating field is being celebrated this year by the American District Steam Co., North Tonawanda, N. Y. In honor of the occasion, the *Adsco Advocate*, published by the company, takes the form of a fiftieth anniversary number. In addition to a review of the industry, from its inception by Birdsill Holly in the early sixties, the issue pays tribute, both to Mr. Holly and to John D. Walsh, who was closely associated with Mr. Holly in working out his many patents.

In the same issue, leading figures in the district heating field review the industry's past progress and future prospects. This is supplemented by an article by Robert Hall, vice-president and manager of the company, who gives details of the strides being made by district heating in such cities as Saginaw, Mich.; Rochester, N. Y.; and Winnipeg, Manitoba.

Another article is devoted to early plants which to-day are being operated successfully. Under the title of "Improvements in Equipment Have Contributed to Advancement of District Heating" are presented descriptions of Adsco products which are playing an important part in the successful operation of district heating plants.

In "A Pledge to Service" Vice-President and Manager Robert Hall states:

"Although district heating has made rapid strides, every indication points to accelerated progress; we see before us the day when public heating will rank with electricity, water and gas, serving everywhere institutions, communities and cities with clean, fireless heat, contributing in large measure to health, comfort, economy and profit.

"This company and its subsidiaries, the Northeastern Piping & Construction Corporation, and the Canadian District Steam Company, Limited, are committed to the extension of district heating and to the service of all those institutions, industrials, public service corporations and municipalities that are giving thought to the distribution of steam for heating, power and other purposes."

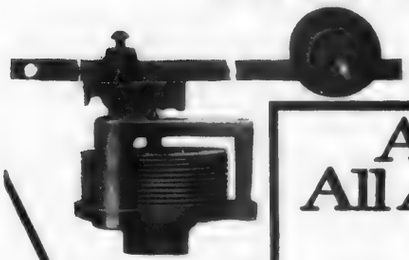
Norman W. Calvert Joins Klipfel Organization

Norman W. Calvert, for the past 13 years connected with the central heating department of the Detroit Edison Co., Detroit, Mich., has become associated with the Klipfel Mfg. Co., 2651 W. Harrison St., Chicago, Ill., manufacturers of the Klipfel line of steam specialties. Mr. Calvert is a prominent figure in the district heating industry, as well as in the heating and ventilating field. He is now president of the Michigan Chapter of the A.S.H. & V.E. The good wishes of a host of friends accompany him in his new activities.

SEE OUR DETAILED DATA IN ASH&VE GUIDE
SEE OUR DETAILED DATA IN ASH&VE GUIDE
Boston Cleveland Chicago New York Philadelphia Los Angeles Kansas City

Sylphon
TRADE MARK

DAMPER REGULATORS



No. 22
for steam
boilers

Your Guarantee THE SYLPHON BELLOWS

The diaphragm of all Sylphon Damper Regulators—recognized by engineers and scientists as the most durable, sensitive expansion unit known.

Standard Equipment on:

Abendroth
Ames
Birchfield
B-Line
Burnham
Coil
Coatesville
Congress
Fitzgibbons-Ontario
Floral City
Freed
Galva
Geneva Foundry Co.
Hart & Crouse
Heggie-Simplex
Imperial
International Economy
Keysco
Keystone
Kewanee
L - O
Lansdale
Molby
National
Novelty
Oil City
Orr & Sembower
Otis-Sawyer-Economy
Peerless Heater Co.
Pierce-Pebco
Putnam
Richardson & Boynton
Richmond
Ross
Senate
Spencer
Standard
Star
Thatcher
Utica
West Coast

A Standard All Along the Line

Sylphon Damper Regulators have been selected as standard equipment by the majority of leading boiler manufacturers, because of the absolute dependability and durability furnished by their exclusively patented diaphragm—the Sylphon Bellows— which guarantees the smooth, continuous operation of dampers, sensitive to the slightest change of temperature.

Your selection of any of these boilers equipped with Sylphon automatic control gives to the user a guarantee of lifelong, automatic damper control with resultant economies, whether the system be hot water or steam. Sylphon Damper Regulators also can be quickly and easily installed on old heating systems with the same degree of heating satisfaction and economy of coal consumption.

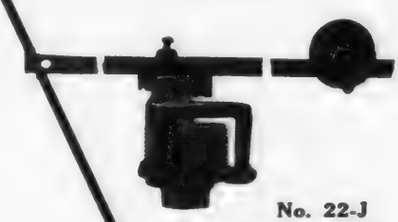
Ask for Bulletin WDR-8

The Fulton Sylphon Company

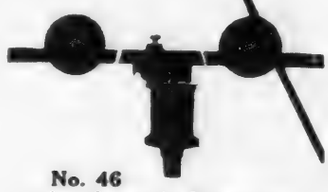
Originators and Patentees of the Sylphon Bellows
Knoxville, Tennessee, U.S.A.

Sales Offices in: New York, Chicago, Detroit, Boston, Philadelphia and all principal cities in U. S. European Representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley St., London, W.1, England. Canadian Representatives: Darling Bros., Ltd., 120 Prince St., Montreal, Quebec.

No.
45-A
for hot water
boilers



No. 22-J
for steam boilers



No. 46
for domestic hot water
supply boilers

For Coal-Fired, Gas or Oil-Burning Systems

Manufacturers' Notes

Reading Iron Co., Reading, Pa., has appointed L. J. Melson as district sales representative in the Cincinnati office, located at 618 Dixie Terminal Building. He previously represented the company through the south in a buying and selling capacity.

Landon Radiator Co., North Tonawanda, N. Y., has opened a showroom at 281 Delaware Ave., Buffalo, which will serve as a western New York sales office, and in addition Archer A. Landon, president, will maintain an office there for his use when in that city.

Rome Brass Radiator Corp., New York, recently opened unique and attractive offices at 1 East 42nd Street. The reception room is most distinctive, and James Erskine, who is responsible for the treatment, has used the Colonial motif in his design. The office also fulfills the function of a sales room, being designed to show the company's products in their natural setting, with one back wall fitted as a bathroom, a pedestal lavatory installed, with concealed radiation showing the recommended treatment for a bathroom. On other walls are models and types of radiators, including those electrically operated.

Newport Boiler Co., Chicago, announces a further expansion of its manufacturing and distributing facilities through a complete affiliation with the Hart Parr Co., Charles City, Ia., established for over a quarter of a century as a manufacturer of quality products. A desire to augment the original interests of the Hart Parr Company in the Newport Boiler Company prompts the placing of the former's facilities and resources behind the Newport boiler. This new affiliation, it is stated, in no way changes the personnel of the Newport organization.

Northern Blower Co., Cleveland, O., announces that its "Norblo" trademark and the word "Norblo" as applied to its dust-collecting systems, sandblasting equipment and similar air-operated apparatus, now has been registered officially in the U. S. Patent Office.

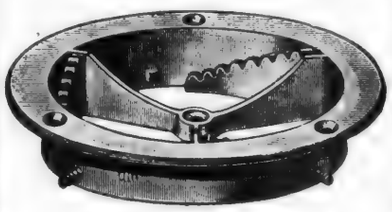
Hardinge Brothers, Inc., Chicago, has increased its capital stock from $1,000,000 to $2,500,000, this being the second action of this kind in 6 years. A rapid growth in the demand for Hardinge oil burners and for the precision lathes, watchmakers' and opticians' tools for which this company is internationally famous, necessitated this move.

Herman Nelson Corp., Moline, Ill., has acquired substantially the entire block in which its factory is located and will construct thereon a material enlargement following a predetermined plan that will ultimately require the expenditure of several hundred thousand dollars. The first two units of the new plant will be a two-story brick building 60 ft. x 120 ft. and a one-story building of the Monitor type, 120 ft. x 140 ft. Ground has already been broken for these buildings, which will cost approximately $85,000. As soon as these buildings are completed, it will be possible to consolidate work that is now being done in rented buildings. It is reported that additional units will be built early in 1928.

Buffalo Forge Co., Buffalo, N. Y., announces the appointment of Davidson & Hunger as managers of its Philadelphia office. L. C. Davidson is a graduate of the University of Kentucky and for the last two years has been located in the Philadelphia office of the Buffalo Forge Company. Robert F. Hunger is a graduate of the Clarkson College of Technology and since graduation has been associated with the Buffalo Forge Company, first in Buffalo and later in its New York office.

Wayne Co., Ft. Wayne, Ind., has appointed Frank E. Mills, for nine years associated with the company, to be sales manager of the home equipment division. F. O. Salee, formerly sales manager, has resigned to establish southern headquarters for the development of sales of Wayne oil burners, refrigerating and water softening equipment. E. J. Lennart, for the past 8 years traffic manager for the company, succeeds Mr. Mills as head of the service department. B. F. Geyer, vice-president and general manager of the Wayne Company, reports that the business of the home equipment division is expanding as rapidly as sound business judgment permits.

View of Bottom Casting



Nu-Notch
REG. U.S. PAT. OFF.

The Most Practical Mushroom Ventilator

FOR ANY KIND OF FLOOR

"Nu-Notch" can be installed complete just before the seats are placed, thus doing away with breakage. Attached to

Wood Floors by 3 lag screws in flange counter-sunk holes.

Concrete Floors by 3 L lugs bolted to floor flange.

Monolithic or similar type of floors, by 3 set screws securing the collar to the sleeve.

"Nu-Notch" is specified by leading architects and engineers. Send for details.

Knowles Mushroom Ventilator Co.

202 Franklin Street **New York City**

The Herman Nelson hiJet Unit Heater

With

The Wedge Core RADIATOR

INDESTRUCTIBLE

TRADE MARK

Leak-proof, rust-proof, indestructible. Lower installation cost, smaller pipe lines, no reducing valves necessary. Never requires service. Freezing cannot harm it. Operating steam pressure from 1 to 150 lbs. Can be suspended from pipe lines or moved from place to place. Long range heat distribution. The ideal heating unit for

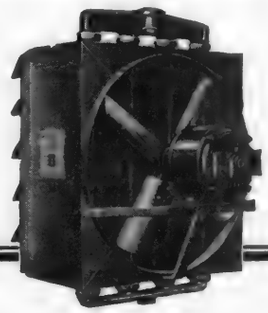
Factories · Mills · Railroad Shops · Roundhouses
Warehouses · Garages · Gymnasiums · Auditoriums

Write for our new catalogue

THE HERMAN NELSON CORPORATION
MOLINE ILLINOIS

Makers of the

UNIVENT *and the* HERMAN NELSON INVISIBLE RADIATOR



Write for your copy of the Herman Nelson hiJet Unit Heater catalogue

The Boss: " . . . . and you've got to get that system done on time. The delays on the Riverville job cost us money.

Old Timer: "Sandholes in the fittings were the cause of that cost. Specify Grinnell fittings on this job and we'll show you some real speed."

The Old Timer Knows

When you see the big "G" on a Cast Iron Fitting, you can know beforehand that it will make on quick, and snug, and *true*. And when the job is done, it's done for keeps, because there's not a lot of undiscovered sandholes to cause time-wasting replacements. Put Grinnell Fittings to the test on your next job. If your jobber hasn't stocked them we'll give you the name of the nearest distributor. Write Grinnell Company, Inc., 280 W. Exchange St., Providence, R. I.

GRINNELL
PIPE FITTINGS

Cast Iron Fittings—Adjustable Pipe Hangers

GRINNELL

Pipe Bends—Welded Headers—Lap Joints—Piping Supplies

American Radiator Company, New York, recently opened a New England display room at 21 High St., Hartford, Conn., under the management of Edward C. Marsden and is so fitted that home-owners, architects and contractors will be in a position to inspect the products of the company.

Federal Radiator Co., Woolworth Bldg., New York, announces the appointment of Francis A. Hadley as New York representative of the company. For the past ten years Mr. Hadley has been New York representative of the Union Radiator Company. In addition to the present appointment, he is the New York representative of "Sands" gas water heater and Page, Monarch and Volunteer boilers.

Titusville Iron Wks., Titusville, Pa., manufacturer of heating and power boilers, has appointed Joseph Herbert as representative in its Chicago office. Mr. Herbert is well known to the industry, through his long association with the Herbert Boiler Co., Chicago.

Williams Oil-O-Matic Heating Corp., Bloomington, Ill., reported earnings for July at $36,118 after taxes. This compares with $32,376 in June. For the first nine months of this year the company reports a net of $83,474 as compared with $462,344 for the same period last year. Assets of July 31, 1927 totaled $1,293,098, including cash and securities of $333,380. Current liabilities were $109,401.

C. A. Dunham Co., 450 East Ohio St., Chicago, announces the appointment of A. M. Morris as manager of its new branch sales office, 206 Water St., Baltimore, Md. An invitation is extended to architects, consulting engineers and heating contractors to avail themselves of the facilities of this office.

National Radiator Corp., Johnstown, Pa., has opened a branch office in the McKinley Bldg., Buffalo, N. Y., in charge of T. A. Novotney with R. C. Lawrence as assistant.

Caloroil Burner Corp., New York, will handle New England business from 260 Tremont St., Boston, Mass. F. H. Johnson has been appointed manager.

Northern Blower Co., Cleveland O., will supply Norblo-Dustless type dust-collecting equipment to be installed at the plant of the Lawrence Portland Cement Co., Cleveland. This equipment is designed to eliminate dust from the cement dryers. The same company will install similar equipment at the plant of the Volunteer Portland Cement Co., Knoxville, Tenn.

Change of Address

Peerless Unit Ventilation Co., Inc., formerly of Long Island City, New York, has moved its main office and factories to Bridgeport, Conn., where quarters have been taken at 718-734 Crescent Ave. New York office of the company is in the Lexington Tower Bldg., 369 Lexington Ave.

Central Station Heating Notes

Kalamazoo, Mich.—Consumers Power Company has placed a contract with the Northeastern Piping and Construction Corp., North Tonawanda, N. Y., for the underground installation in connection with a complete district heating plant to serve the business section of Kalamazoo.

Lansing, Mich.—The Board of Water and Electric Light Commissioners has placed a contract with the Northeastern Piping and Construction Corp., North Tonawanda, N. Y., for the installation of a high-pressure steam transmission line to convey steam at 300 lbs. pressure from their Cedar Street Plant to the Ottawa Street Plant in Lansing.

Phoenix, Ariz.—Lescher and Mahoney are the architects for a central heating plant for the State Capitol, which will be started immediately. The cost of the structure is estimated at $25,000.

Kalamazoo, Mich.—What is described as the first franchise granted by popular vote in Kalamazoo in 32 years, has been given to the Consumers Power Company for operating a district heating plant in that city. D. E. Karn, is district manager for Kalamazoo and will have charge of the construction of the new system.

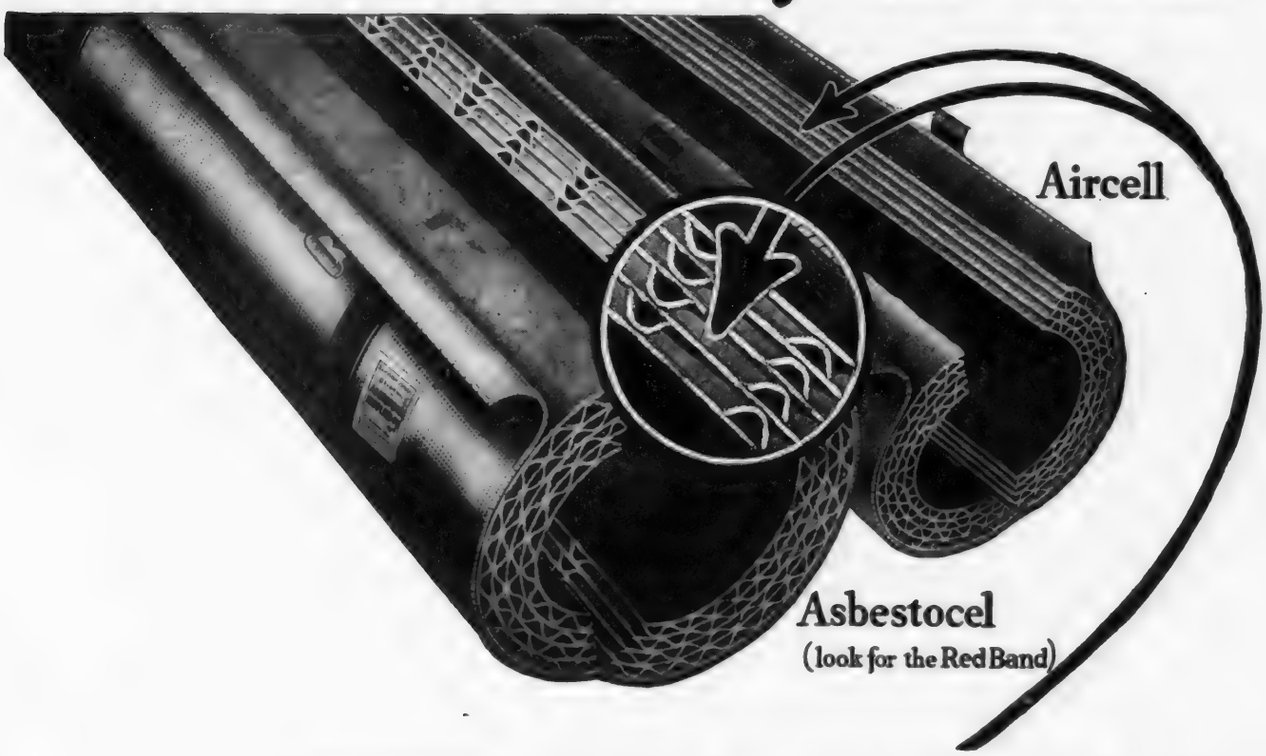
YEOMANS
YEOMANS PUMPS GIVE YEOMAN SERVICE
HORIZONTAL AND VERTICAL AUTOMATIC ELECTRIC
Condensation Pumps
A thorough investigation of this pump will reveal the best material, the finest workmanship, resulting in a noiseless, rugged, reliable product that will give dependable service for many years.
For automatically returning condensation to boilers from low pressure gravity steam heating systems.

Also manufacturers of Bilge Pumps, Centrifugal Pumps, Sewage Ejectors, Sewage Pumps, etc.
Literature on request
YEOMANS BROTHERS COMPANY
1421 Dayton St., Chicago
Representatives in all principal cities
12

E Z
RADIATOR HANGER
For ALL Tube Type Radiators
The most complete stock on the market—ready for immediate shipment from principal cities. Use this strong, simple, one-bolt hanger. It pays to insist on the E-Z.
Healy-Ruff Co.
772 Hampden Ave.
St. Paul, Minn.

½" PIPE
Style R

Over 20 times
the number of air-cells



TWENTY small closed cells are more efficient as a heating-pipe insulation than one large open cell.

Johns-Manville Improved Asbestocel has over twenty times the number of air cells per 3 foot section than an equal length of ordinary pipe covering. Cross corrugations running around the section break up the lengthwise corrugations into small, closed, isolated cells. In ordinary pipe covering the corrugations extend the entire length of the section and are open at the ends. Through them air may circulate freely.

Because of this greater number of small cells, Improved Asbestocel saves more heat and more coal. And it lasts longer because added corrugations give increased strength.

Specify Improved Asbestocel. You can always identify it by the red band at each end of every section.

JOHNS-MANVILLE CORPORATION Madison Ave. at 41st. St., New York
Branches in all large cities For Canada: Canadian Johns-Manville Co., Ltd., Toronto

Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE
Improved
Asbestocel

Trane Co., LaCrosse, Wis., is building a 90 ft. x 20 ft. addition to their laboratory which will be of hollow tile and steel construction. The room will be used only for experimentation work.

Dry Steam Valve Sales Corp., 565 Fifth Ave., New York, has appointed Arthur A. Kiewitz to its sales engineering force.

National Steel Tank & Mfg. Co., Bradford, Ill., announces that Ralph M. Powers, has been elected president of the company. Mr. Powers for the past 20 years has been connected with the Kewanee Boiler Company and has a wide acquaintance in the heating trade.

Lincoln Electric Co., C'eveland, O., has transferred R. P. Nick from the Baltimore, Md., office to the Lancaster, Pa., office, where he will be in charge of the sale of Linc-Weld motors and Stable-Arc welders.

C. A. Dunham Co., Chicago, announces that on October 4, 1927, Method Patent No. 1644114 was issued to C. A. Dunham and assigned to the company. This covers the Dunham differential vacuum heating system, advertisements of which appear in our columns.

POSITION WANTED—Heating, ventilating and power engineer. Twenty years' experience. Also experienced in plumbing, sprinkler and oil burner construction, engineering and sales. Active in executive capacity past ten years. Permanent position desired. Address Box 124, care of Heating and Ventilating Magazine.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

POSITION WANTED—By man with thorough experience both in office and on road, in heating, ventilating and power piping work. Can design, estimate or superintend installation, any work on these lines. Address Box 125, care of Heating and Ventilating Magazine.

WANTED—A first class estimator on heating and ventilating work. Steady position for right party. State age, number of years experience and salary expected. Living conditions about the same as you will find in any other good town of about 50,000 people; four months out of the year winter, and the winter is very mild. North Carolina section. Address Box 121, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representatives on commission basis. Address Box 122, care of heating and Ventilating Magazine.

WANTED—By a nationally-known manufacturer and distributor of vapor heating specialties, sales engineers for several districts in mid-west and the east who have a high grade clientele among the architects and heating contractors, coupled with proven ability to make heating plans, marked sales ability and of high moral character, to sell vapor heating specialties and systems on a most liberal commission basis. A rare opportunity as a side line to men possessing these requirements and who already maintain an office. With your application please give your present line of business, the territory you cover, experience and age. Address Box 123, care of Heating and Ventilating Magazine.

THE MAN WHO KNOWS IS THE MAN WHO WINS

And you'll always find that the Technically Trained man is the winner!

The course mapped out for you by the St. Louis Technical Institute is one that leads to quick and sure success, because no essential point is overlooked. Lessons are easy to grasp because they are based on natural progress. Become a foreman! Own your own shop! **We can show you how!** Your income can increase from three times on with your own application to our method of training! Let us send you full information on any of the following:

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Plumbing Design and Installation.
- ☐ Warm Air Heating.
- ☐ Contracting and Estimating.
- ☐ Mechanical Drafting.

Saint Louis Technical Institute.
Est. 1910

The most thorough institution for Technical Home Study to-day.

4543 Clayton Avenue. St. Louis, Mo.

JAMES M. SEYMOUR

Established 1888

Lawrence St., Mechanic St. and Kirk Place, NEWARK, NEW JERSEY

AUDITORIUM FANS, 36" to 120" to fit any square opening. SEYMOUR FANS sold subject to substantial discount. Furnished with suitable pulley or coupling for direct connection TWIN FANS include shafting and center bearing.

Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.

SEND for BULLETINS, PRICES, and DISCOUNTS

New Home Study Course in Gravity Steam and Water Heating

The New Home Study Course in Gravity Steam and Water Heating **which has been one of the most popular features in THE HEATING AND VENTILATING MAGAZINE during the past two years is now ready in loose-leaf form (without instruction features) for the astonishing low price of**

$10.00

Never before offered in reprinted form except to purchasers of the correspondence course which sells for $120.00. Send for full details.

HEATING & VENTILATING MAGAZINE CO.
1123 Broadway NEW YORK

KAUFFMAN

AIR DIFFUSERS

SINCE 1908

Kauffman Air Diffusers

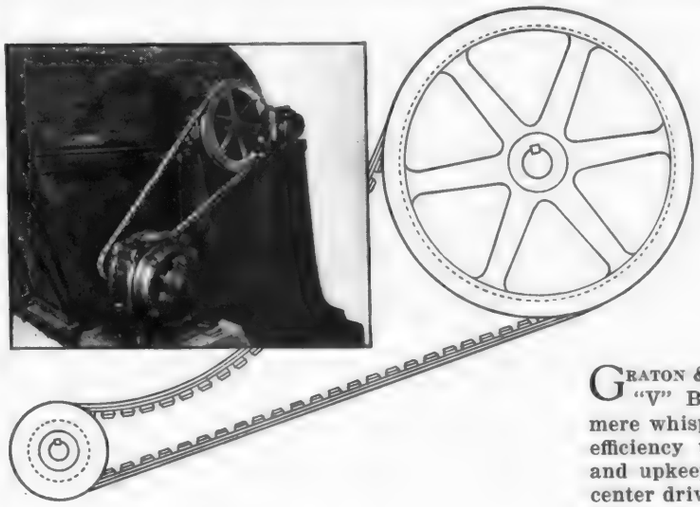
HAVE BEEN IN USE IN

Some of America's Finest Theatres

Simple to Install—Low in Price

Graduated Air Control

AMERICAN METAL PRODUCTS CORP.
ST. LOUIS, U. S. A.



SILENT POSITIVE EFFICIENT

GRATON & KNIGHT leather "V" Belts run with a mere whisper, and with an efficiency that cuts power and upkeep costs on short center drives. Made of flexible leather which absorbs the strain of sudden heavy loads and stoppages that ruin ordinary drives in a short while. Positive in action—works best when *slack*, reducing frictional losses. Light and clean—runs dry, without grease.

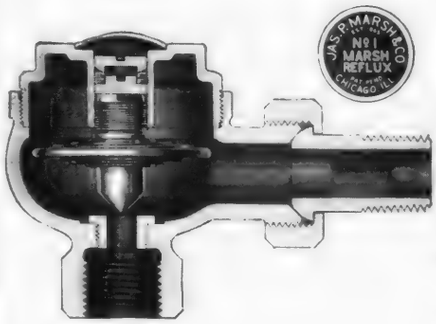
Graton & Knight leather "V" Belts have never been known to fray or pulverize. There are hundreds of them giving satisfactory service today, under adverse conditions, where other drives had failed. If you want proof we'll be glad to send you records of Graton & Knight leather "V" Belts on actual installations.

Write for Recommendations or Data. Our engineering Department is fully equipped and always ready to give you helpful recommendations or data on short center drives.

GRATON & KNIGHT COMPANY
Worcester, Mass.

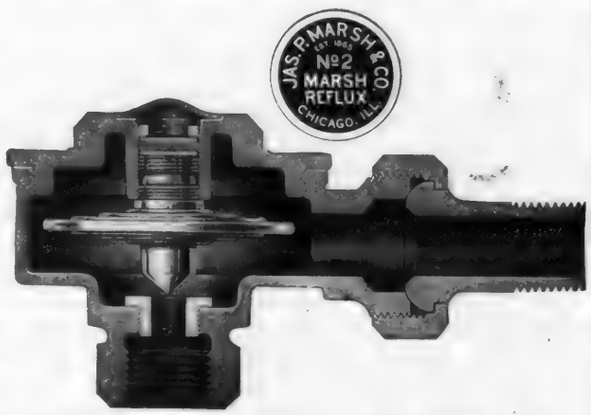
GRATON & KNIGHT
Standardized
LEATHER BELTING LASTS LONGER

MARSH REFLUX THERMOSTATIC RADIATOR TRAPS



GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



The Most Economical, Practical and Efficient Trap for the Average Sized Unit

Marsh Reflux Traps assure full efficiency of Radiator Coil and System.

Automatically discharge air and the water of condensation as fast as it is formed.

The Trap closes the instant steam or vapor strikes the thermostatic diaphragm. Vapor or steam cannot pass through the Trap; therefore every atom of heat is given off in the radiator or coil.

Just one movable part—nothing loose to rattle, chatter or make a noise.

Neat in appearance, handsomely finished and heavily nickel-plated.

The Economical, Practical and Efficient Trap for Both Small and Large Units

Marsh Reflux Traps are all-metal construction-including heavy cast brass body, handsomely nickel-plated and with extra heavy special tail piece.

The one movable part—a genuine phosphor bronze non-collapsible Thermostatic Diaphragm—contains the combination of volatile fluids so balanced as to, at all times, distinguish between air and water of condensation and vapor or steam. So corrugated and constructed to eliminate the slightest possibility of rupture from alternate expansion and contraction.

JAS P. MARSH & CO. 114-124 So. Clinton St. **Chicago**
ESTABLISHED 1865

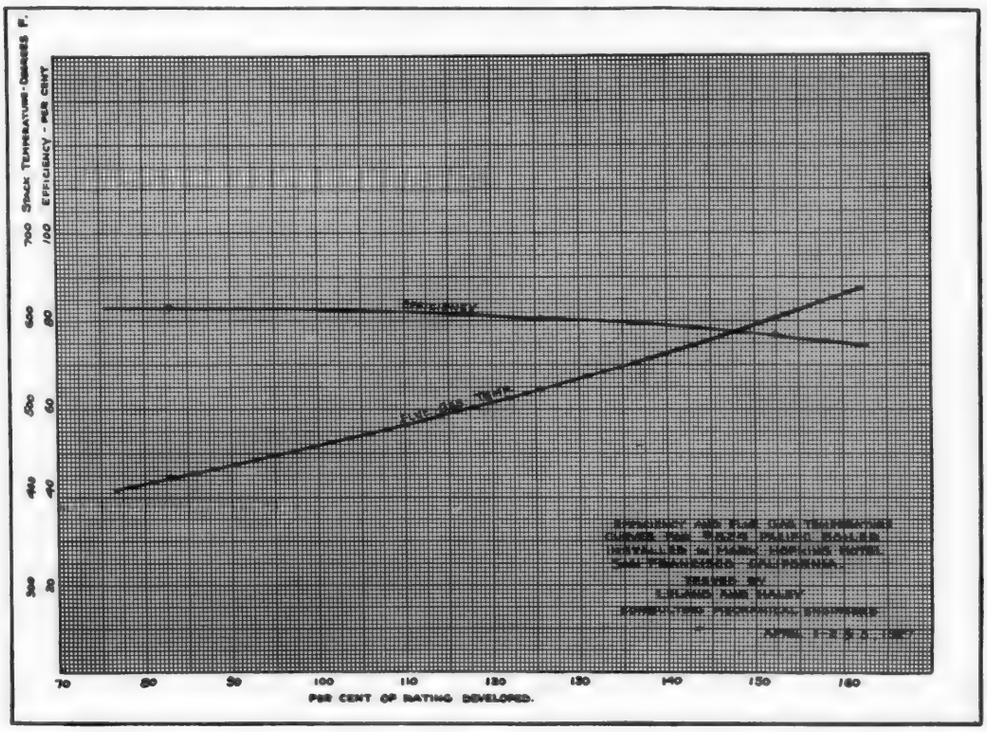
62 YEARS CONTINUOUS EXPERIENCE IN MANUFACTURE OF STEAM SPECIALTIES

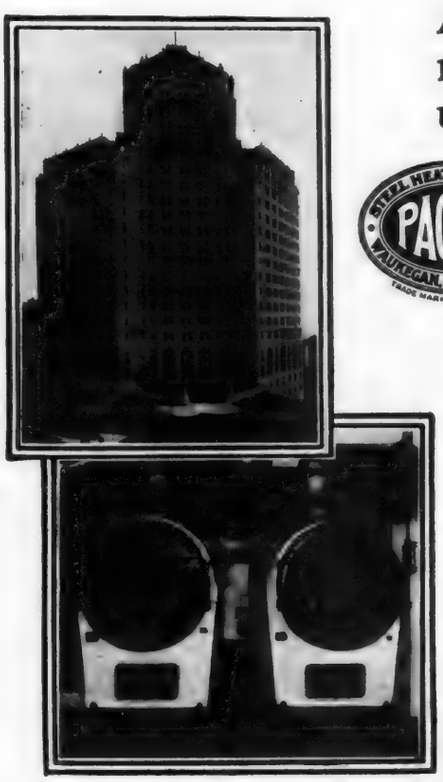
Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents—Indicating and Recording Gauges

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario.

THE HEATING AND VENTILATING MAGAZINE, published monthly by THE HEATING AND VENTILATING MAGAZINE CO., at 1123 Broadway, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXIV, No. 12, December, 1927. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

Flue Gas Temperature
Only 600° F. at 152% of Rating





Mark Hopkins Hotel, San Francisco. Geo. D. Smith, Managing Director. Weeks & Day, Architects, Leland & Haley, Mechanical Engineers, Knittle Bros., Heating Contractors. Two No. 824 Rear Oil-Fired 14000 square foot Pacific Boilers installed.

Actual operating test reveals remarkable ability of the Pacific to utilize heat of combustion gases.

In the Pacific, the heat of the burning fuel is used in making steam and not wasted up the stack. This fact was demonstrated once for all in the notable test conducted by Leland & Haley, well-known Mechanical Engineers, for the Mark Hopkins Hotel at San Francisco. In the test, the flue temperature ranged from 422° F. at 82.8% of rating (normal operation for this building with only one boiler in the line) to only 603° at 152.4% of rating, under a heavy fire.

These figures are doubly significant because they were obtained by independent engineers under actual operating conditions, five months after the boilers were placed in operation. Get the complete story, including certified report, in the Mark Hopkins Hotel Test Booklet. Sent upon request.

PACIFIC
STEEL HEATING BOILERS
FACTORIES: WAUKEGAN, ILL. BRISTOL, PA.

FOR UNUSUAL DEPENDABILITY

STEEL HEATING BOILERS

Whenever unusual strength and dependability are needed, men instinctively turn to steel.

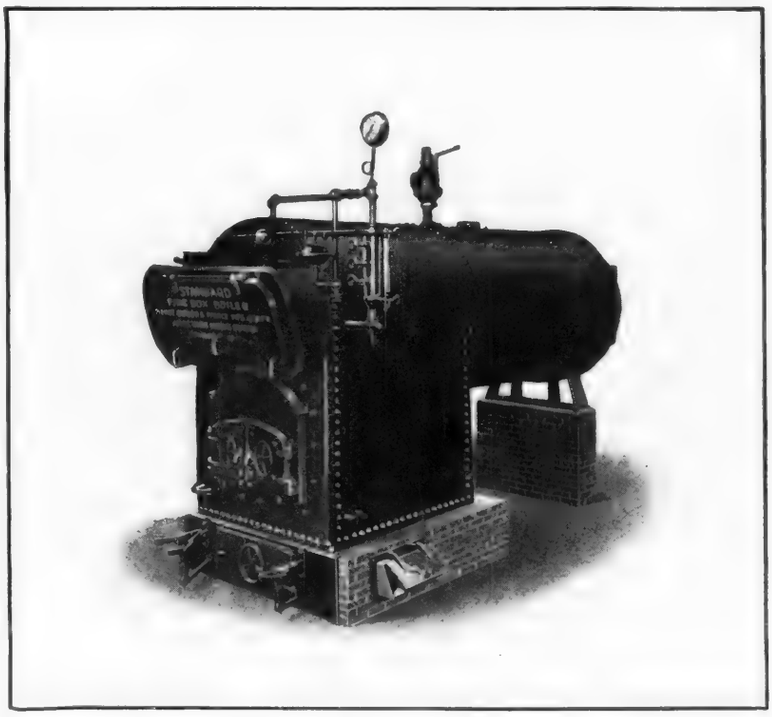
Without steel we could have no railroads—no big ships, nor bridges—no skyscrapers. For ONLY STEEL can be depended upon to stand great stress and strain.

To be sure of getting a boiler with the dependable strength that insures long life, free from repair bills—specify a STEEL heating boiler.

STEEL HEATING BOILERS DIVISION

The American Boiler Manufacturers Association

AMES



FIREBOX HEATING BOILERS

AMES IRON WORKS

Division of

PIERCE, BUTLER & PIERCE

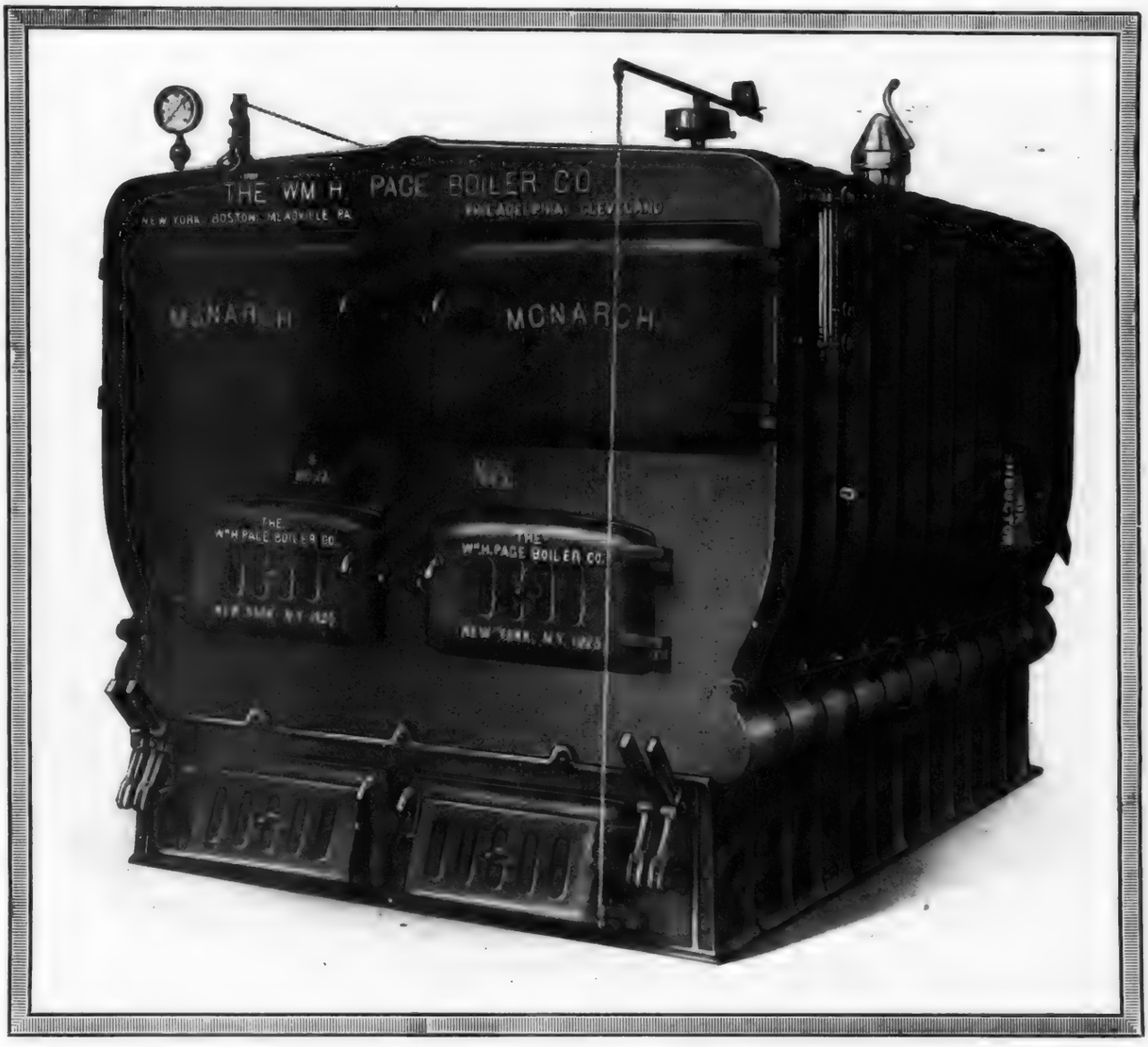
MANUFACTURING CORPORATION

Main Office and Works

OSWEGO, N. Y.

General Sales Offices

41 EAST 42nd STREET, NEW YORK CITY



Page Smokeless IS Smokeless!

The 60" Monarch Smokeless Boiler is the last word in cast iron boiler construction for large heating installations.

It complies with most rigid smoke ordinances, and realizes fully the economies resulting from burning the gases ordinarily given off as smoke.

❦ ❦ ❦ ❦

Also made in smaller sizes for smaller buildings.

Burns Any Coal, Oil or Gas

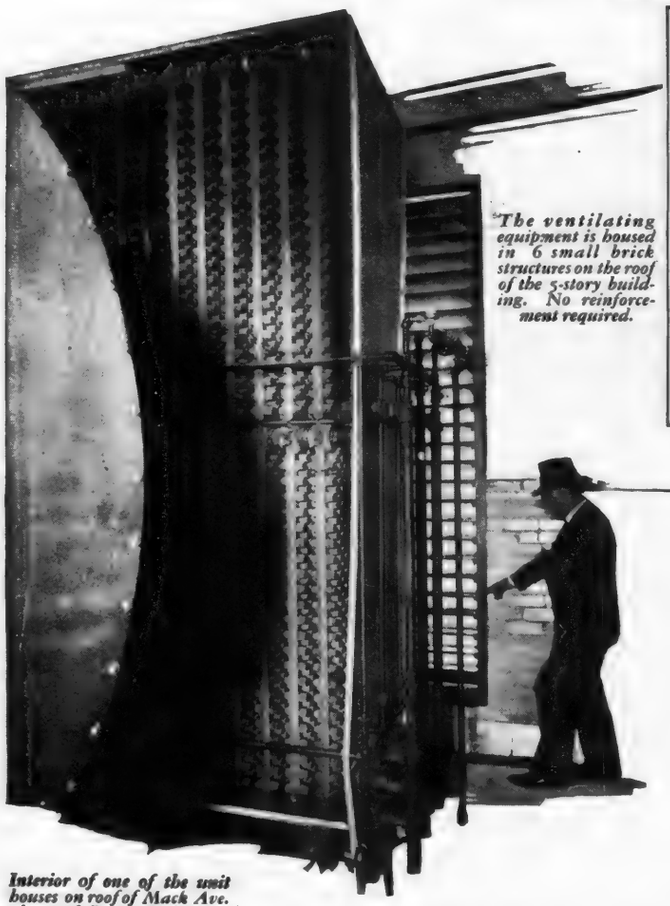
THE WM. H. PAGE BOILER COMPANY

Makers of a Complete Line of Round and Square Steam and Water Boilers

General Offices: 200 Madison Ave., New York.

Branch Offices and Warehouses: BOSTON, 123 Beverly Street; CLEVELAND, Rose Building; BROOKLYN 98 49th Street.
Factory: MEADVILLE, PENNSYLVANIA

VENTO



Interior of one of the unit houses on roof of Mack Ave. plant of Briggs Mfg. Co., Detroit, (Photo taken during course of construction.) Heating & Ventilating Contractors, Pittlekow Heating & Engineering Co; Fan equipment — American Blower Company.

The ventilating equipment is housed in 6 small brick structures on the roof of the 5-story building. No reinforcement required.

New Briggs Body Plant installs 11,000 sq. feet VENTO

An uncommonly effective ventilating system is provided for the new paint shop of the mammoth automobile body plant of the Briggs Manufacturing Company on Mack Ave., Detroit.

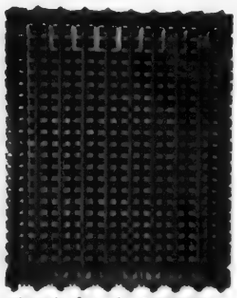
The ventilating equipment consists at present of six units, each composed principally of a motor-driven fan and 11,000 square feet of VENTO Blast Heaters. The equipment is placed on the roof of the 5-story factory, and *no reinforcement to the building was required.*

The air in the paint shop is changed every 2½ minutes, and the blast temperature averages 70 degrees F.

This installation gives further proof of the high rate of heat transfer through VENTO cast iron blast heaters. The stacks are exposed almost entirely to the outside. Four to six times the volume of air usually required in industrial systems is instantly warmed in the passage through stacks of VENTO heaters arranged 19 long, 2 high and 3 deep.

* * * *

As in every instance where Engineers and Architects are taking alternate figures, the *net installed cost* of VENTO is demonstrated to be much less than that of other types of heaters. Obviously, therefore, there is no advantage in using other forms of heaters, since for over a quarter of a century there has never been any record of VENTO failure.



A typical stack of VENTO Cast Iron Heaters

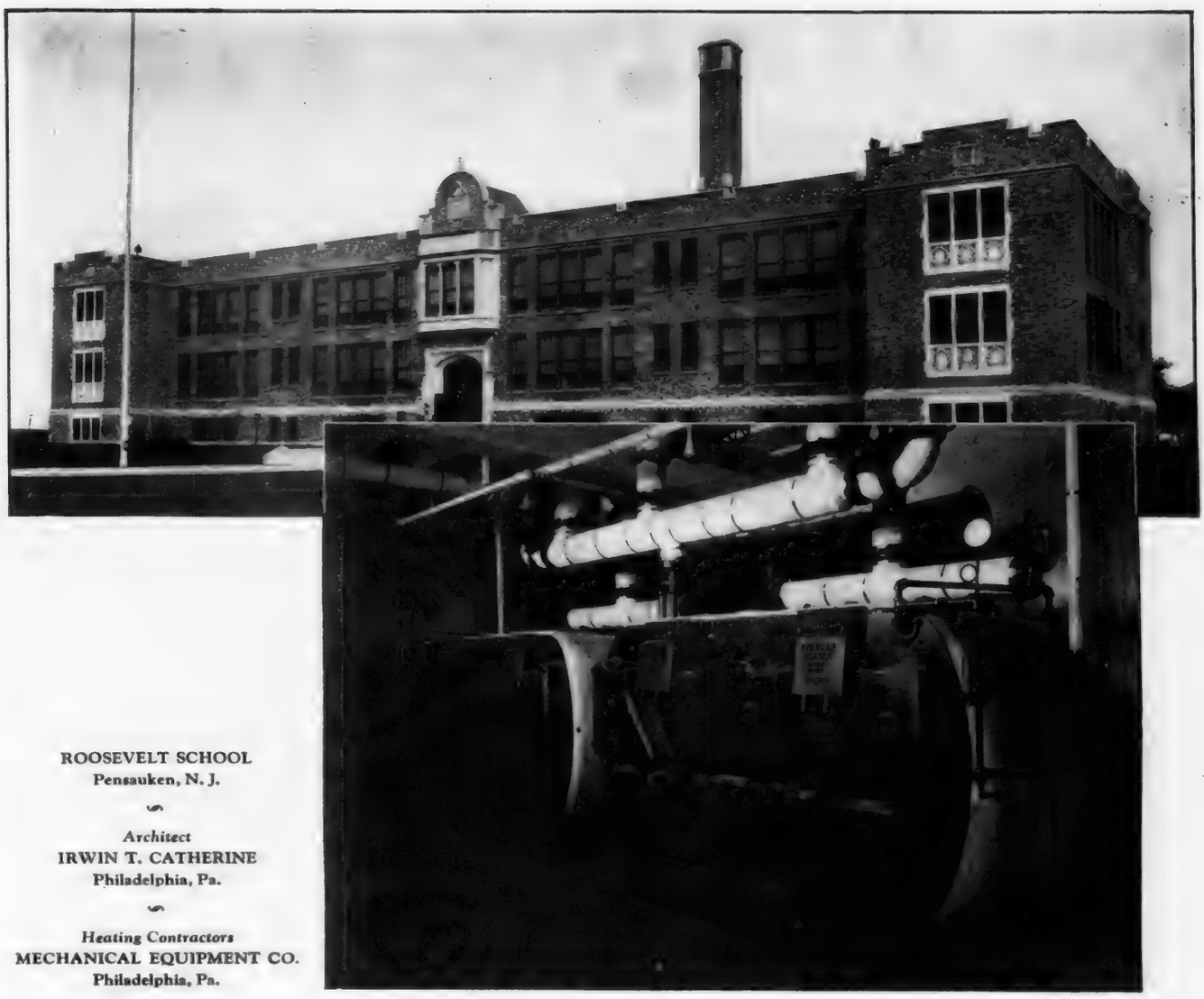
Our Engineers' Data Book and other illustrated literature on ventilation should be in the hands of Architects, Engineers and Contractors for public buildings and factories. These books are sent free on request.

AMERICAN RADIATOR COMPANY

VENTO DEPARTMENT: 816-820 South Michigan Ave., Chicago

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.

Showrooms and sales offices: New York, Boston, Providence, New Haven, Newark, Philadelphia, Baltimore, Washington, Richmond, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Atlanta, Chicago, Milwaukee, Indianapolis, St. Louis, St. Paul, Minneapolis Omaha, Kansas City, Denver, San Francisco, Los Angeles, Seattle, Toronto, London, Paris, M lan, Brussels, Berlin.



ROOSEVELT SCHOOL
Pensauken, N. J.

Architect
IRWIN T. CATHERINE
Philadelphia, Pa.

Heating Contractors
MECHANICAL EQUIPMENT CO.
Philadelphia, Pa.

Equivalent direct radiation 16,900 sq. ft.

Heated by two No. 3-105 Spencer Steel Tubular Heaters, capacity 10,500 sq. ft. each.

Two No. 3-105 Spencers are heating the Longfellow School, Pensauken, a duplicate of the Roosevelt School.

"A SIZE AND TYPE FOR EVERY HEATING REQUIREMENT"

Spencer
steam, vapor or hot water
Heaters
burn No. 1 Buckwheat Coal

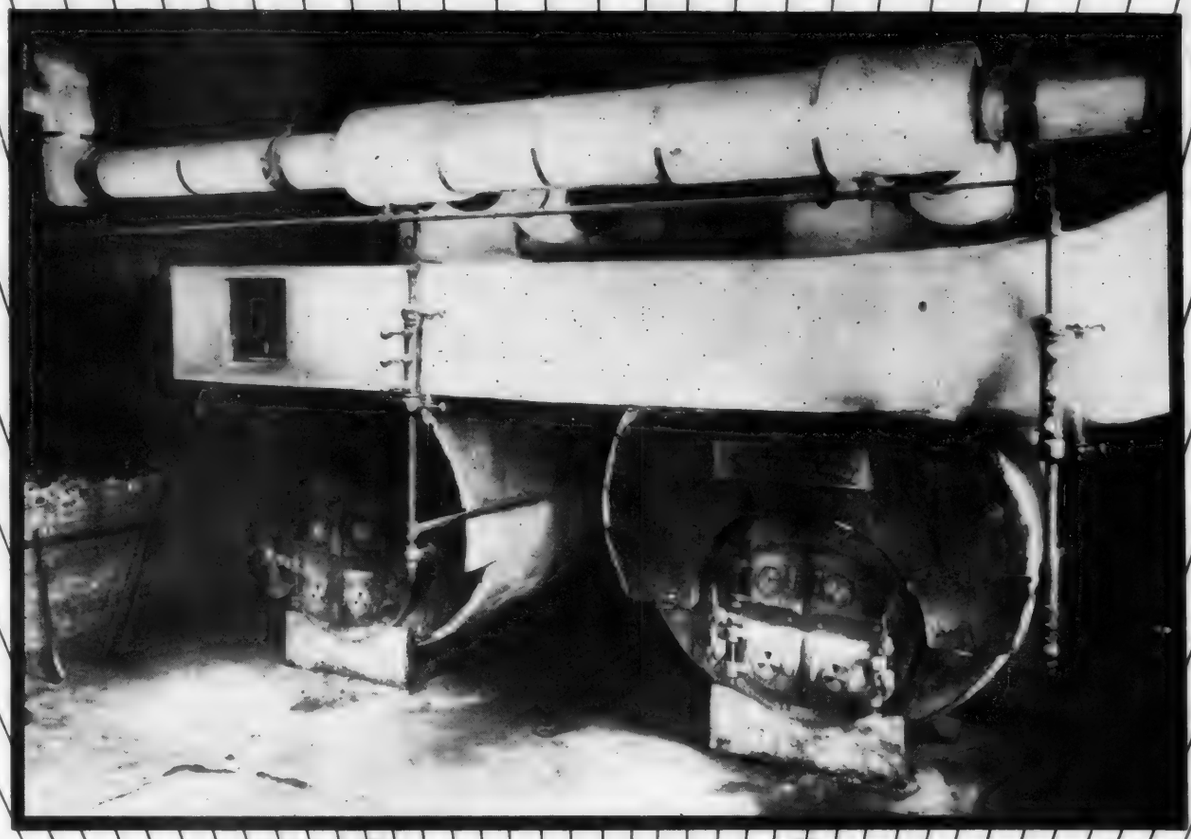
SPENCER HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.

New York City Boston Philadelphia Baltimore Buffalo Rochester Hartford Albany Syracuse Scranton

Division of Lycoming Manufacturing Company

STEAM CAPACITIES: Cast Iron Sectional *from 600 feet to 3,200 feet.* Steel Tubular *from 2,000 feet to 16,000 feet*

The DRAKE APARTMENT HOTEL
NEW YORK CITY
Architect: Emery Roth
Engineers: Jaros & Baum
Plumbing and Heating Contractors
Geo. E. Gibson Co.
Where millions are invested—
In ultra modern structures such as this—a monument to architectural and engineering skill—no chance can be taken in specifications—dependability only can be considered! Towering with magnificent lines over twenty stories from the street, this charming hotel-apartment is the result of care and precision in the selection of materials of proven worth—equipment of lasting durability and quality.
Thus, "NATIONAL" Pipe, as in other great buildings, was specified for the major pipe tonnage. Back of all the many luxuries and comforts which this fine housing will offer will be miles and miles of "NATIONAL"—to serve faithfully for many years to come.
NATIONAL TUBE COMPANY
Frick Building, Pittsburgh, Pa.
NATIONAL



Titusville Scotch Boilers

Require only two thirds of the space and burn considerably less coal

¶ A Public School Superintendent in Jersey City recommended that these Titusville Boilers be installed in Public School Number 9, replacing two other boilers, after he observed the highly efficient operation of Titusville Scotch Boilers in another school.

¶ After installation it was found that the Titusville Scotch Boilers required only two thirds of the space of the other boilers. In economical operation they have exceeded all expectations, supplying more heat radiation and requiring a great deal less coal.

¶ This Titusville Boiler installation is typical of hundreds of other buildings throughout the country enjoying the combined advantage of fuel economy with high heating efficiency.

THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PA.

A simple grille is the only visible sign of any heating apparatus.

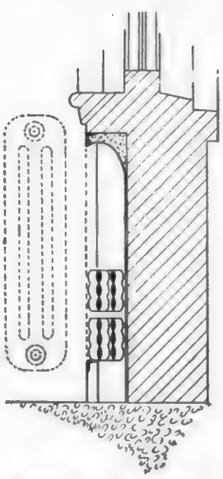
Keep the Radiators Out Of The Space In Front Of The Windows

Unless filled with cast iron radiators, the best space in the room is in front of the windows.

Put Robras 20-20 radiators in the walls out of sight.
They are designed to be concealed.

A single Robras 20-20 section requires a space only two and a half inches deep. An assembly two sections wide requires a recess less than four inches deep.

Sections range in length from eighteen inches, rated at five and a half square feet to seventy inches, rated at twenty-five square feet. They can't leak or burst from freezing. They need no painting or other upkeep.



Method of installing two tier four section Robras 20-20 radiator in the wall.

Your name sent us will bring you discount and data sheets.

ROME BRASS RADIATOR
CORPORATION
1 East 42nd Street, New York City

Eight section thirty-two inches long in a space four inches deep. Total radiation eighty-four square feet.

"The Owner has decided on the ROSS Steel BOILER for all future Operations"

Architect,
R. THOMAS SHORT

TELEPHONE MIDWOOD 8340

C. & J. BENDER
HEATING AND VENTILATING
1734 FLATBUSH AVENUE
BROOKLYN N. Y.

March 16, 1927

Frost Mfg. Co.
Galesburg, Ill.

Gentlemen:

We thought you would be interested to hear something of our experience with the Ross Boiler which we tried out in the new theatre building at Huntington, Long Island.

This is a 10,000 ft. boiler, carrying a net load of 8300 ft. Of five other steel boilers which we have used in theatre buildings on practically the same basis of operating conditions, we have found that the Ross has given us the best performance from both a steaming and economical standpoint.

The economy and ease of operation of this boiler are truly remarkable, and are evidence that you have produced a boiler suitable to present day fuel conditions.

This boiler has been working all winter during building operation, with both mains and boiler uncovered, and under adverse conditions gave us the best of satisfaction. We might add that the owner and builder has decided on the Ross for all future operations.

Yours very truly,

C. & J. Bender

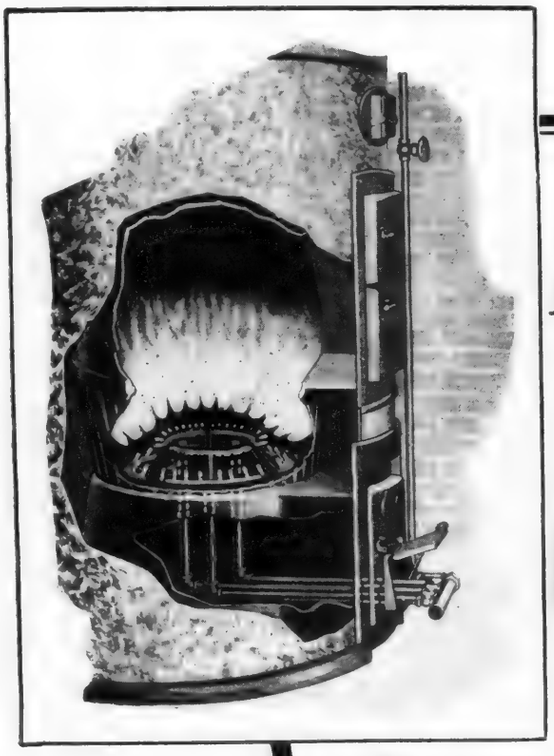
The remarkable part of this letter is the last paragraph. Read that if nothing more. Architects and heating contractors are satisfied that when they specify "Ross" Boilers, there will be no dissatisfaction or regrets because this boiler is built of open hearth steel electrically welded and ordinarily outlasts the building. Furthermore no other boiler has the distinct heating efficiency advantage that comes from the exclusive patented feature of the Full Length Convex Self Cleaning Crown Sheet. For satisfaction that grows with use specify the Ross Steel Boiler on your next installation.

The Frost Manufacturing Co.
SINCE 1851
1520 Henderson Street Galesburg, Illinois

Eastern Distributors:
THE ROSS BOILER CO., Inc.
101 Park Ave., New York

BRANCHES

Atlanta	Cleveland	Milwaukee	Peoria
Baltimore	Cincinnati	Memphis	Rochester
Brooklyn	Duluth	New Orleans	San Antonio
Chicago	Ft. Worth	Omaha	St. Louis
Detroit	Lincoln		Toronto, Canada



Help your customers do it better With Gas

With BARBER Patented JET GAS BURNERS

GAS Companies all over the country are pointing the way to bigger profits for you from the sale and installation of gas heating equipment.

Why don't you cash in on this free publicity by showing your customers that they cannot only "do it better with gas," but that they can "do it *still* better with BARBER Patented Jet Gas Burners?"

BARBER BURNERS develop from 15% to 35% more heat with the same amount of fuel, than mixer type burners.

Check up on the users of gas heating installations in your territory. Send us the Trade Name, the Number and Name of the Manufacturer of the furnace or boiler.

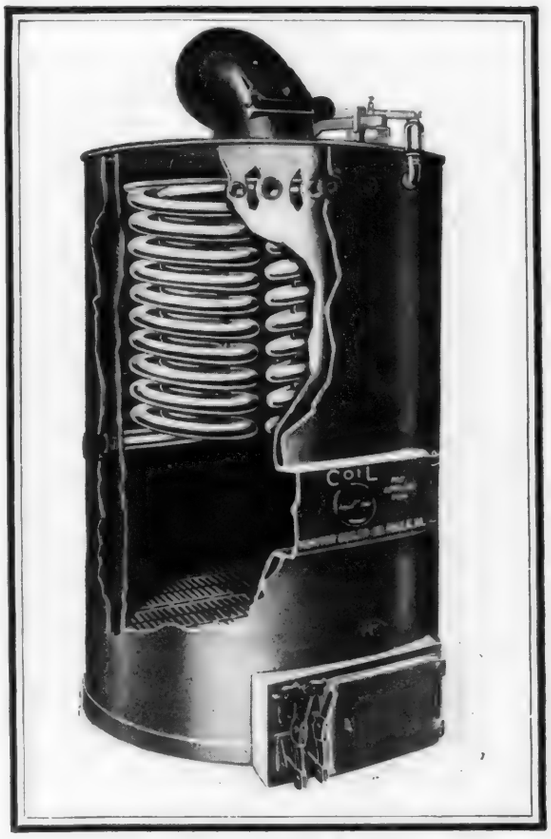
Our Engineering Department will furnish detailed specifications showing just the type of BARBER Patented Jet BURNER Equipment needed. Then order from the factory.

You take no chances. It is a clear case of additional profit, that's all.

Let us send you complete NEW literature and "Sales Helps" which we will gladly supply upon request

The CLEVELAND GAS BURNER & APPLIANCE CO.
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

OIL BURNING BOILER



COAL BURNING BOILER

For Oil or Coal Fuel

The greatest economy that you can effect for your customers is going to be your greatest profit. In COIL Boilers, economy for your customers is an assured fact.

They are proven fuel and labor savers. They are easy to install and easy to take care of.

You absolutely cannot go wrong with COIL Boilers.

Write for complete information and prices.

MONITOR BOILER COMPANY
1505 Race Street, PHILADELPHIA, PA.

COIL

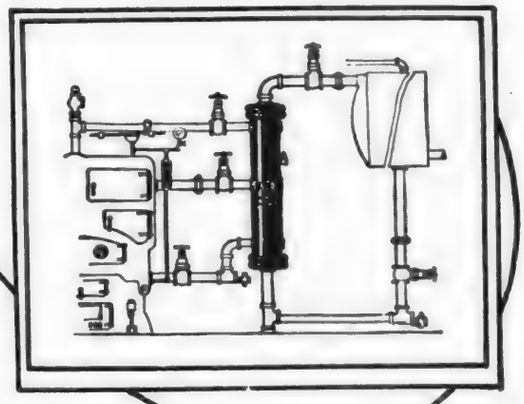
STEEL HEATING BOILERS AND WATER HEATERS

Patented
December 27, 1921

A No. 75 Semi-Indirect Taco Water Heater gives satisfactory service in this thoroughly modern Y. M. C. A. Building at Flushing, Long Island, New York.

There is no better method than the use of Taco Heaters for assuring the constant and plentiful supply of hot water for shower baths required by Y. M. C. A. Buildings, clubs, and other establishments which have gymnasiums.

THERMAL APPLIANCE COMPANY
342 Madison Avenue, New York



A Repeat Order of Coatesville Boilers after 30 Years of Satisfactory Service

BACK in 1897 when the Friends' Hospital of Philadelphia needed Boilers they purchased Coatesvilles.

When they built the new and modern self-contained Power Plant shown above, they needed Boilers, and once again they purchased Coatesvilles.

There are three 78" x 18' – 0" Coatesville H.R.T. Boilers in this Power House, with provision made for a fourth boiler, as requirements demand. These Coatesville Boilers supply steam for current generation, heating and laundry use, etc. The Engineer for this job was Mr. Albert C. Wood of Philadelphia.

This is but one instance of "ONCE A COATESVILLE BOILER, ALWAYS A COATESVILLE BOILER," and it bears out the saying, "that Repeat Orders are the most conclusive evidence of complete satisfaction."

Coatesville Boilers are available in the following types: Horizontal Return Tubular, Vertical, Marine, Locomotive, All Steel Fire Box Heating and Power Boilers.

Bulletins upon any of the above may be had upon request.

Note: Coatesville is also in a position to meet your requirements for Tanks and Steel Plate Work.

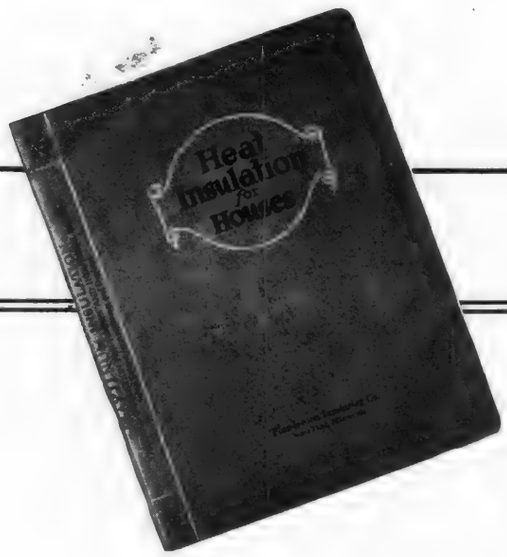
If it's a Coatesville Boiler, it's a Good Boiler

COATESVILLE BOILER WORKS

Boilers - Tanks - Steel Plate Work

Main Office and Works—COATESVILLE, PA.

Philadelphia	New York	Boston	Pittsburgh	Baltimore
111 S. 15th St.	30 Church St.	141 Milk St.	Union Trust Bldg.	Lexington Bldg.



A New Insulation Manual for ENGINEERS

A NEW 64-page manual. *"Heat Insulation for Houses"*, has just been published by FLAX-LI-NUM. Every heating engineer will find it an unusually useful, accurate and complete treatise.

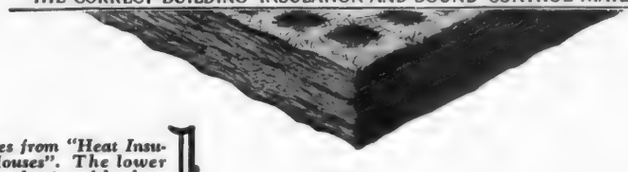
In this book are given the transmission coefficients of all types of insulated and uninsulated walls and roofs, with full data on radiation and fuel savings in actual buildings. In conjunction with the FLAX-LI-NUM chart for proportioning radiation, calculations are reduced to the simplest form and are based on actual heat losses from the building.

A copy of the new Manual and the Radiation Chart will be sent upon request, to any heating engineer.

FLAX-LI-NUM INSULATING COMPANY
ST. PAUL, MINNESOTA

Flax-li-num

THE CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL



Typical pages from "Heat Insulation for Houses". The lower plate is a reproduction of the chart for proportioning radiation.

KNOWLTON "WATERTOOB" STEEL BOILERS

AUTOMATIC DAMPER CONTROL

All Knowlton "Watertoob" Steel Boilers are equipped with super-sensitive damper regulators, containing a one-piece corrugated copper bellows. A manually operated damper is also provided at the side of the boiler for different weather conditions and for easy opening of the draft when firing.

GRATES

The grate bars of the Knowlton "Watertoob" Steel Boilers are semi-circular on top with teeth like a stone crusher, easily shaken with no space between them through which coal may fall.

RATING

Knowlton "Watertoob" Steel Boilers are rated at the NET amount of steam or hot water radiation they will supply. It is not necessary to select a boiler with a larger rating to supply the correct amount of radiation.

OIL OR GAS INSTALLATIONS

Because of its rapid circulation and maximum absorption of heat, due largely to inclined Arsenical Copper Tubes and Baffle arrangement, the boiler reacts immediately when burning oil or gas.

THE BOILER THAT OUTLASTS THE BUILDING BECAUSE IT IS BUILT OF

COPPER-BEARING STEEL

and

ARSENICAL COPPER TUBES

KNOWLTON "WATERTOOB" LOW PRESSURE BOILERS are built of Copper-Bearing Steel. This feature combines the strength of steel with protection and resistance to corrosion.

WATER CIRCULATION — a number of copper tubes of small diameter are used, placed close together. This feature gives rapid heat absorption, transmitting heat quickly and efficiently. The circulation of water is further accelerated because the copper tubes are set at an angle instead of horizontally, giving constant rapid circulation. Baffles force the gases to pass back and forth over the tubes, transmitting a maximum of heat from the fuel. ***Write us for complete information***

ORR & SEMBOWER, Inc., Reading, Pennsylvania

(Established Since 1885)

MANUFACTURERS OF KNOWLTON "WATERTOOB" STEEL BOILERS

In any building,

The various forms of Celotex meet every insulation need. In private homes use Celotex Standard Building Board in walls, ceilings and roof. It makes homes cooler in summer, warmer in winter, easier and less expensive to heat.

In large buildings, Celotex Roof Insulation Board is applied to the roof. The proper thickness gives effective protection against extremes of temperature, reduces heat losses and saves fuel money. Celotex Roof Insulation Board is easily applied to any type of roof.

CELOTEX

INSULATING LUMBER

large or small . . .

Celotex reduces Heating Plant Load

Built into walls, ceilings and roofs, broad strong Celotex boards bring increased comfort and save fuel

THE problems of the heating engineer are greatly simplified by the proper use of Celotex. This effective insulating material is as much a part of the heating system as boilers, pipes and radiators. Correctly applied, it reduces the load on any heating and ventilating plant by lowering the heat loss through walls and roof.

The thermal conductivity of Celotex is remarkably low. Broad strong Celotex boards, felted from tough cane fibre, are easily applied to any type of building and give necessary protection to the heating plant wherever used.

In private homes, Celotex Standard Building Board is applied to walls, ceilings, and roof. Its high insulating value holds heat in the house, brings increased comfort and saves fuel.

In larger buildings, Celotex Roof Insulation Board is applied to the roof in two or more layers. This greatly reduces the heat loss through the roof, makes top floor rooms easier to heat in winter and more comfortable in summer.

Another form, Celotex Industrial Insulation Board, is used to insulate warm and cold air ducts. Here Celotex gives better protection than other air duct insulators; costs less and is easier to apply.

The heating plants you design and install will always give better satisfaction in buildings protected with Celotex. If you are not now using this remarkable material it will pay you to get complete information. Send the coupon for the Celotex folders, containing valuable charts, or tell us your insulating problems. We are always ready to work with you, without obligation.

THE CELOTEX COMPANY, Chicago, Ill.

Mills: New Orleans, Louisiana

Branch Sales Offices in many principal cities (See telephone books for addresses)

Sales Distributors throughout the World

Canadian Representatives: Alexander Murray & Co., Ltd., Montreal

ALL RELIABLE LUMBER DEALERS CAN SUPPLY CELOTEX

THE CELOTEX COMPANY,
645 N. Michigan Ave., Chicago, Illinois

I can use the folders on Fuel Saving, Correction of Condensation, Radiation, Coefficients of Transmission, and Specifications for applying Celotex Industrial Board.

Name.....

Street.....

City..... *State*.....

Heat. & Vent.—12-27

4 steps in extracting profit from cold steam radiators

(1) First the *air* must be removed. But that's like rolling off a log to the "Warco" No. 2 Radiator Vacuum Valve—particularly if the "Warco" No. 6 is doing its part in *equalizing* the steam mains.

(2) Then, your bill must be submitted. Of course, the "Warco" No. 2 can't do that—but you'd be surprised at what a wonderful little helper it is in speeding up payment! Because, you see, it not only expels air from a steam radiator, but *keeps it out.* So, when your bill's received, the radiators are certain to be still hot and silent!

(3) Next you wait a week or two—maybe "holding your breath", wondering whether there's going to be a "service call". But you have that experience only once, for you soon learn that all of the Seven "Warcos" are *fool-proof* and *trouble-free.*

(4) Finally, a week later—or, perhaps, a month—you get another order—then another, and another—from the customer you made *permanently comfortable* with the little "Warco" No. 2, which is *guaranteed,* when properly installed and operated, to STAY SOLD for five years or more.

The New "Warco" No. 2 Vacuum Valve
(This cut 1-1/3 actual size.)

Send now for your copy of interesting folder, "Make Your Steam Installations Do Better Work."

W. A. RUSSELL & COMPANY, Grand Central Terminal Bldg. New York City
Chicago Boston Pittsburgh Los Angeles
Established 1890

"Warco"
TRADE MARK REGISTERED

Automatic Air & Vacuum

Valves

"WARCO" No. 6

When installing "Warco" No. 2 on radiators, "Warco" No. 6—a Quick Vent Vacuum Air Valve—should be installed on mains. By means of an exclusive adjustable feature, the "Warco" No. 6

EQUALIZES THE MAINS.

(This cut ¼ actual size.)

ARCO

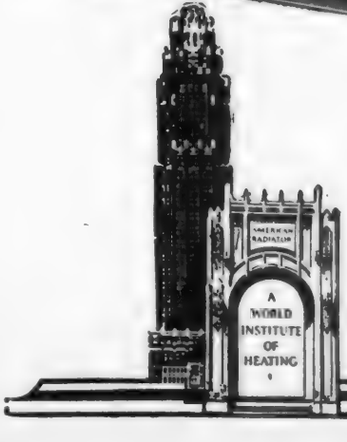
You Can Install ARCO PACKLESS VALVES in Every Residence in your Community

ARCO Packless Valves are as valuable to the small dwelling-place as to the large hotel, apartment house or office building. No home-owner wants his radiator surroundings damaged because of leaky valves. And if you will but show your client the small difference in cost between the packed valve, on the one hand, and ARCO Packless with its protection against damage from leaks, on the other, you will be astonished to find how ready and willing he is to pay for the continued protection of ARCO Packless, and its relief from periodical repacking expense.

The homes illustrated on this page are just a few of a countless number equipped with ARCO Packless Valves, and of which we have photographs. You can place ARCO Packless Valves in every such residence in your community.

Go after this business now. You do not need us to tell you that ARCO Packless is the valve for every job—steam, water or vapor—for new work or the modernization of old jobs.

Individualize your work by having your name etched in nickel on the ARCO Packless black dial. It will identify you with the satisfaction your customer is bound to derive from an ARCO Packless Valve Installation



AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION

816-20 South Michigan Avenue Chicago, Illinois

Makers of:—

AIRID AIR VALVE No. 500

ARCO PACKLESS VALVE No. 988

ARCO WATER REGULATOR No. 800

DETROIT EQUALIZING VALVE No. 104

MERCOID CONTROLS

The Boiling Point of Water

at the highest attained airplane altitude differs but 1.16 degrees from that in

The Dunham Differential Vacuum Heating System

ON JANUARY 29, 1926 Lieut. John A. McCready climbed to 38,704 feet (approximately 7⅓ miles.) This is but 823 feet higher than the altitude represented by the pressure conditions possible in the Dunham Differential Vacuum Heating System when operating under 25 inches of vacuum. At this altitude the barometric pressure is approximately 4.9 inches mecury instead of 29.92 as at sea level.

Water forms steam at the boiling point. The temperature at which water boils decreases as the pressure upon its surface is decreased.

At the greatest height that man has reached with the aid of the airplane the boiling point of water is 131.84 degrees. This is *but* 1.16 *degrees lower than that attained in the Dunham Differential Vacuum Heating System* when operating at a pressure of 25 inches of vacuum corresponding to 133 degrees shown in chart below.

This heating system is able to adapt itself automatically to any conditions of outdoor temperature. It produces sub-atmospheric steam for circulation in radiators and piping on mild days *at boiling points lower than exist on any mountain peak on the earth's surface, and within approximately 1 degree of the boiling point of the highest altitude thus far reached by any airplane.*

U. S. Patent No. 1644114. Additional patents in the United States, Canada and Foreign Countries now pending

New York Power Show

A cordial invitation is extended to visit our Exhibit in operation in Booths 701 and 702, 4th floor, in charge of Chief Engineer Thinn.

The DUNHAM Difr-enshal-Vacm Heating System. A FIXED DIFFERENTIAL IN PRESSURE — A VARIABLE DEGREE OF VACUUM

C. A. DUNHAM CO.

DUNHAM BUILDING
450 East Ohio Street, Chicago

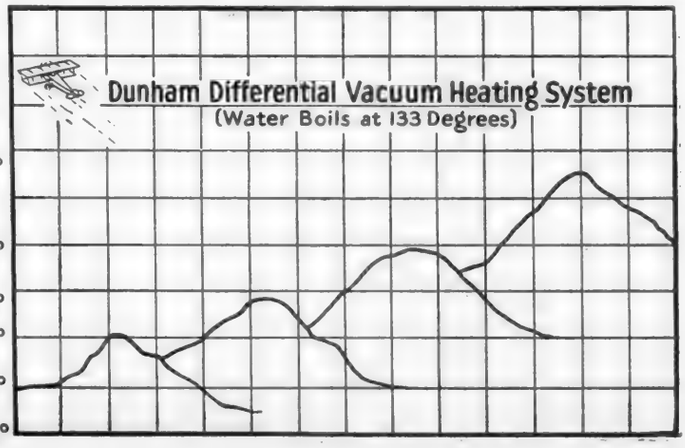
Over seventy branch and local sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

Look for the Name
DUNHAM

This nameplate identifies a genuine DUNHAM Radiator Trap

Elevation	Altitude Feet	Boiling Point
Mt. Everest	29,002	149.2°
Mt. McKinley	20,000	167.3°
Pike's Peak	14,180	179.6°
Mt. Hood	11,225	186.1°
Denver	5,279	199.7°
Sea Level	0	212.0°

38,704 feet
37,881 feet



The Dunham Differential Vacuum Heating System

It strikes a balance

THE Dunham Differential Vacuum Heating System strikes a balance between the Heat-output of the radiation and the Heat-loss of the building. Daily weather reports record fluctuations in outdoor temperature running as high as forty degrees in a few hours' time. Firing the boiler to meet such conditions in the ordinary heating system merely results in under- or over-heating, with a marked fuel waste.

The DUNHAM Difr-enshal-Vacm Heating System

This system has a widely variable heat-output because it operates under a wide variation in sub-atmospheric steam pressures and with steam temperatures as low as 133°. This corresponds to an operating range of 25″ of vacuum at the low point. How effectively this system operates is shown by the following data:

HEATING DATA

9-Story Office Building, Chicago, Season 1926-1927

Brick masonry and fireproof interior construction. Approximately 31,325 sq. ft. rentable floor area and 345,783 cubic feet volume. No heat insulation used in wall or roof construction. Building 60x82 exposed on all sides except for a six-story brick building 48 feet deep, on east side.

	Outside Temp.	Inside Temp.	Average Vacuum in Boiler, In.	Average Vacuum in Return Line	Gal. of Oil 18-20 Baume
October	52.4	72.8	13.19	17.40	2150
November	37.0	71.6	16.27	18.47	3620
December	26.6	70.3	10.99	13.42	5360
January	24.8	71.2	13.00	14.83	5010
February	35.0	70.5	13.92	14.61	2834
March	42.0	70.9	16.88	17.55	2526
April	47.8	71.4	17.22	17.97	1973
May	56.8	70.8	19.85	20.53	1145
Average	40.3	71.2	15.18	16.84	3077

	CO_2 Per cent.	Flue Temp.	Average Hours Operating	K. W. to Pump	Average Gal. Oil per Day
October	....	...	7.7	....	71.67
November	....	...	11.9	....	120.67
December	....	...	13.8	437.0	172.90
January	10.40	230	16.7	532.0	161.61
February	8.46	243	12.8	318.0	101.21
March	10.25	...	12.3	469.0	81.48
April	10.23	...	10.3	407.0	65.77
May	9.65	224	7.1	382.0	36.94
Average	9.8	232	11.6	318	101.53

Total Direct Radiation Installed..... 7704 Square Feet
Total Direct Radiation in Use..... 6000 Square Feet
Total Gallons of Oil (18-20 Baumé)..... 24.618

Positive economies of operation and greater comfort of tenants are offered by the Dunham Differential Vacuum Heating System, which is receiving nation-wide recognition and this fuel-conserving system is being installed in all types of buildings throughout the country.

Look for the Name
DUNHAM
This nameplate identifies a genuine DUNHAM Radiator Trap

This is an Exclusive DUNHAM *Development*

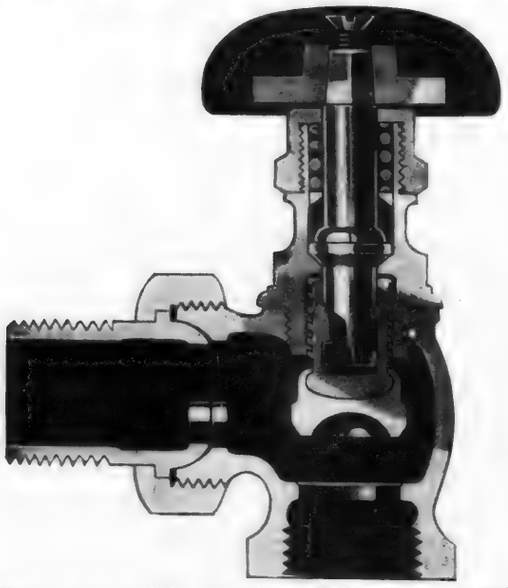
U. S. Patent No. 1644114. Additional patents in the United States, Canada and Foreign countries now pending.

C. A. DUNHAM CO.

DUNHAM BUILDING
450 East Ohio Street, Chicago

Over seventy branch and local sales offices in the United States, Canada and the United Kingdom, bring Dunham Heating Service as close to you as your telephone.
Consult your telephone directory for the address of our office in your city An engineer will counsel with you on any project.

Marsh Re-enforced Packless Water Radiator Valves



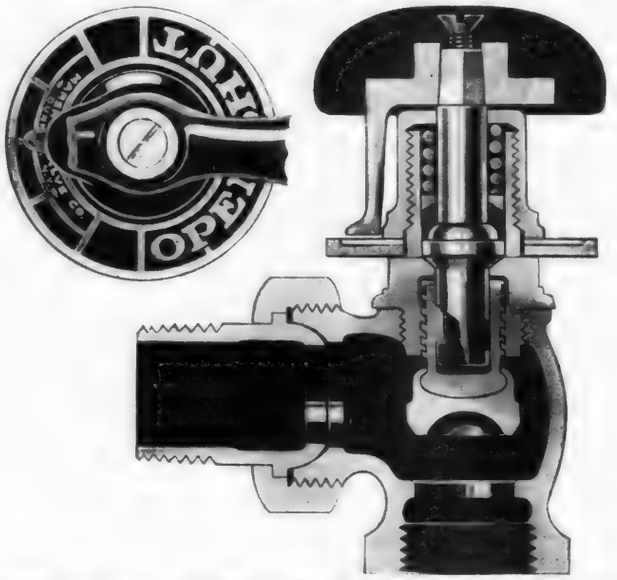
Oval Wheel
or
Lock Shield

Fig. 137

These valves are quick opening, full pipe capacity, and are GUARANTEED NOT TO STICK AT ANY TIME, OR LEAK AT ANY PRESSURE that a cast iron boiler and radiation will stand.

We believe they are the only Packless valves which will hold high pressure forced circulation and also protect against taking in of air around stem in a sealed system, *two very necessary requirements* for satisfactory service and cost no more than the cheap competition valves. Get our prices.

Marsh Re-enforced Graduated Water Radiator Valves



Oval Wheel,
Lever Handle
or
Lock Shield

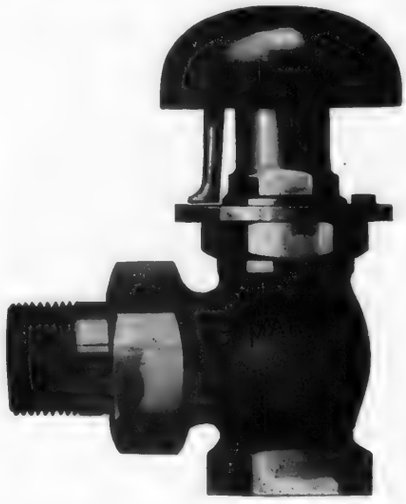


Fig. 139

With these GRADUATED Valves we regulate water heat temperature THROUGH VALVE, the same as for a vapor or vacuum steam system through a Modulating Valve. These are not only of material value for residence service, but we have thousands in use for high pressure service in schools, hospitals and public buildings.

These valves cost but little more than our regular water valves and much less than steam modulated valves.

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

Exclusive Sale Distributors

Edward T. Hetherington
1718 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs,
431 So. Dearborn St., Chicago, Ill.

United States Radiator Corp'n
General Offices: Detroit, Mich.

Jas. P. Marsh & Company
118 So. Clinton St., Chicago, Ill.

All territory east of west lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County, "Chicago, Illinois."

Taylor-Forbes Company, Guelph, Ont., Canadian Agents

See Our Display
at the
POWER SHOW
Booths 312-313

Only a Superior Valve Could Stand the Strain

Barnes & Jones Valves on the Test Rack.

Every part entering into every B. & J. Valve is individually inspected and tested before assembling. Every assembled valve is subjected to a steam and water pressure test of extreme severity.

If there is a weak place in any Barnes & Jones Valve, this exacting test discloses it. Barnes & Jones want any of their Vapor Equipment that is going to prove defective to do so right on the factory test-rack, rather than later in any of their installations.

Hence, this severe test—applied to every stock valve. There's nothing so satisfying as being sure that all customers will be permanently satisfied.

The Reason: "Made Like an Instrument"

B. & J. Vapor Valves stand this test because they are better made. Examine particularly their *bronze* castings and note that in every detail of design and finish B. & J. Valves are literally "Made Like an Instrument"—that is, finely made for fine work.

Barnes & Jones

QUALITY HEATING SYSTEMS

**128 Brookside Ave.,
Jamaica Plain, Boston**

**126 East 44th St.
New York City**

AIRID

Sell AIRID AIR VALVES *On Every Trouble Call*

NO. 500 AIRID AIR VALVE

VAC-AIRID Vacuum Valve No. 510
For "below atmosphere" installations. Permits the air to escape, but prevents its return into the system. Contains the venting qualities of No. 500 AIRID and adds the vacuum feature.
List price $4.00.

Instruct your men to talk AIRID every time they go into a home on a trouble call. Such calls give you and your men an excellent opportunity to determine whether the home is steam-heated and, if so, whether the radiators are equipped with AIRID. If they are not then you know those radiators should have AIRID Air Valves.

Train your men to explain to the home owner how AIRID rids radiators of air—quickly and silently—without leaking steam or water; that this means hot radiators all the time; that AIRIDS need no adjustment, and fit any steam radiator.

Here is an opportunity to increase your sales.

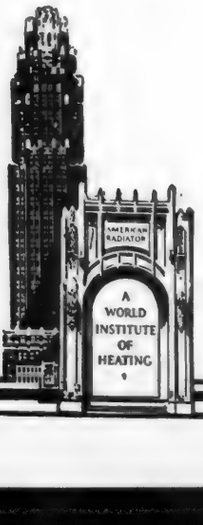
The low price of AIRID to the user—$1.35—makes it possible for every home owner to have one on every radiator in the home, and permits the contractor to use AIRID on all jobs—*no matter how competitive.* Guaranteed for five years.

AIRID offers you the extra income from daily over-the-counter sales—all winter long. Get your share of this business. Display the attractive AIRID cartons—conspicuously—now—so as to engage home-owners' attention to the strong magazine campaign that is running during the heating season.

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION
816-20 South Michigan Avenue Chicago, Illinois

Makers of:—



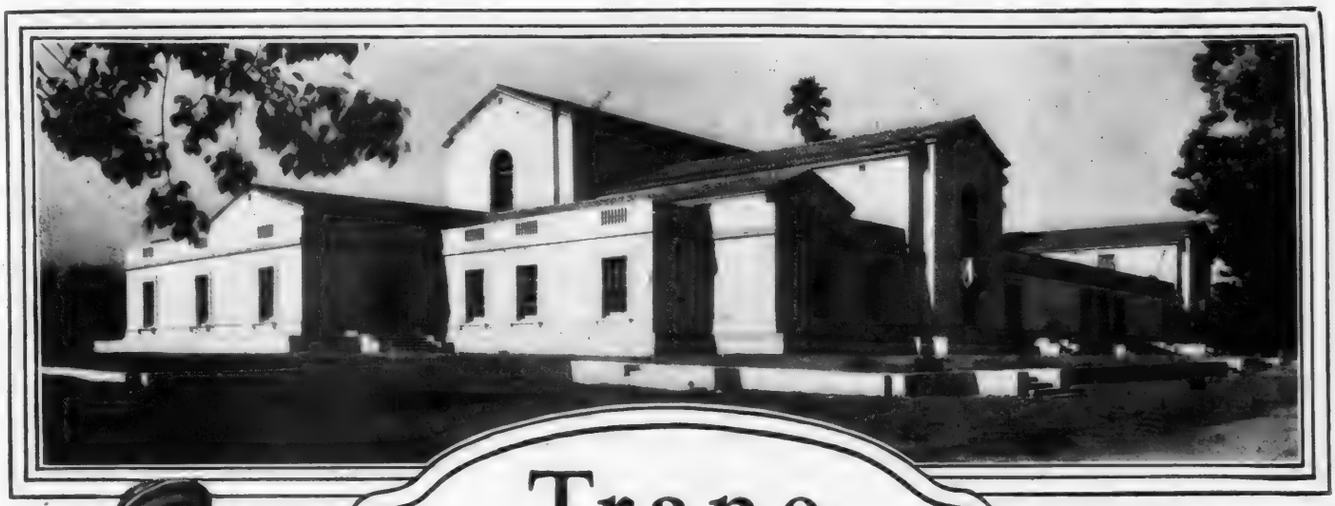
AIRID AIR VALVE No. 500

ARCO PACKLESS VALVE No. 988

ARCO WATER REGULATOR No. 800

DETROIT EQUALIZING VALVE No. 104

MERCOID CONTROLS



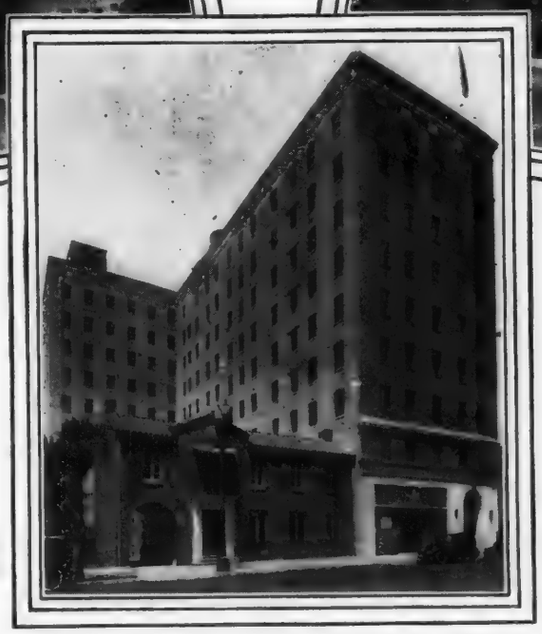
Trane Equipped

—the cream of Southern California heating installations

Pasadena Library Bldg., 48 Trane Traps, 26 Trane Valves. Trane Vacuum Pump, Trane Circulating Pump.

Pacific Coast Club, Long Beach. 211 Trane Traps, Trane Duplex Return Line Vacuum Pump.

Hotel Normandie, Los Angeles, 122 Trane Traps, Trane Return Line Vacuum Pump.

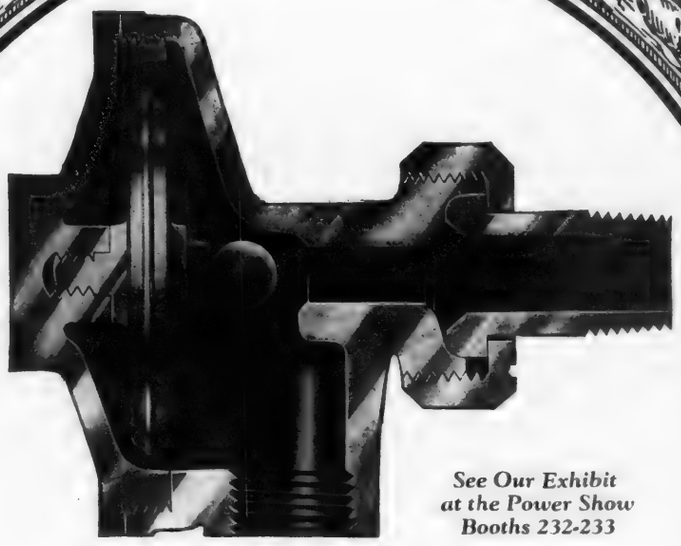


California Medical Bldg., Los Angeles. 371 Trane Traps, Trane Return Line Vacuum Pump.

Installations like these are equal to reams of argument as to the standing of Trane Traps and Valves in the heating world today. Ask The Trane Company (Est. 1885), 206 Cameron Ave., La Crosse, Wis., for Bulletin 14.

HEAT CABINETS **TRANE** CONCEALED HEATERS

••• PUMPS AND HEATING SPECIALTIES •••



See Our Exhibit at the Power Show Booths 232-233

ILLINOIS
HEATING SYSTEMS

The ILLINOIS *Thermo Trap*

ordinarily used on low pressures, but built strong enough to operate on pressures up to 100 pounds without damage to the sensitive diaphragm

All Illinois Heating Systems whether vacuum or vapor, use this trap on all radiators. It has many exclusive advantages that have been largely responsible for the outstanding success of these systems.

The *proven* advantages of Illinois Heating Systems are:

—operation below atmospheric steam pressure—at vacuum vapor pressures.

—a moderate, healthful heat during mild weather, avoiding overheating common to ordinary steam jobs.

—all the heat you want in winter weather by adjusting firing periods.

—operation four-fifths of the time with banked fires.

—easy control of room temperatures.

—a remarkable fuel economy.

—durability of apparatus.

—noiseless operation.

Write for Vapor Details Bulletin 22

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD. PRES. **INCORPORATED 1900**

BRANCHES AND REPRESENTATIVES IN 40 CITIES

CHICAGO

Many Hospital selected

MILVACO HEATING EQUIPMENT

for over a quarter of a century manufacturers of Standard Valves and Heating Specialties

These three buildings are new additions to the Cook County Hospital, Chicago

Milvaco Packless Radiator Valve.

MILVACO Packless Radiator Valves were chosen by the builders of the above pictured Cook County Hospital buildings because they knew thru experience that these time tested valves would be functioning 20 years from now with the same efficiency that they function today.

{ Eric E. Hall, *Architect*—H. A. Durr & Co., *Mechanical Engineers*—Great Lakes Construction Co., *General Contractors*—Kinzie Engineering Co., *Heating Contractors*. }

HEATING SPECIALTIES:
Milvaco Traps, Dole Milvaco Packless Valves—all types. Air Vents, Air Eliminators, Drip Traps, Blast Traps, Direct Return Traps.

STANDARD VALVES:
Packed Type Radiator Valves, Gate Valves, Globe Valves, Angle Valves, Check Valves.

MILWAUKEE VALVE CO. MILWAUKEE, WIS.

Announcement

Of Particular Interest to ENGINEERS

A NEW COMPANY—new in name only—has been formed and is now building heat transfer equipment of every type and size. . . . The company will be known as

HEAT TRANSFER PRODUCTS, Inc.
A Division of the
STATEN ISLAND SHIPBUILDING CO.
with the following officers:

WILLIAM J. DAVIDSON, *Chairman* GEORGE T. JACOCKS, *President* GEORGE H. BATES, *Treasurer*
SYLVAN J. CROOKER, *Vice-President* WALTER S. OGILVY, *Vice-President & Sec.*

The officers and personnel are men widely known for their engineering ability and achievements in design and construction.

With unlimited resources and manufacturing facilities to produce apparatus of any size, this company is ready to place at your disposal the largest and most complete engineering and production facilities in the industry and to cooperate with you on the design of the following equipment:

Heat Exchangers	**Condensers**	**Boilers**
Feed Water Heaters	**Evaporators**	**Tanks**
Bleeder Heaters	**Oil Heaters**	**Piping**
Storage Heaters	**Humidifiers**	**Pumps**
Superheaters	**De-Humidifiers**	**Coils and Bends**
Service Water Heaters	**Waste Heat Extractors**	**Fabricated Plate Work**

and special equipment for the following applications:

Power Plants	**Gas Plants**	**Refrigeration**
Oil Refining	**Air Conditioning**	**Textile Mills**
Chemical Plants	**Heating and Ventilating**	**Laundries, etc.**

We will consider it a privilege to send you in detail any information you desire on your particular heat transfer problems

HEAT TRANSFER PRODUCTS, Inc.

A Division of the
STATEN ISLAND SHIPBUILDING CO.
90 West Street, New York

ADSCO District Heating Installations

ADSCO 22 in. and 10 in. steam main construction installed in Washington St., Scranton, Pa., for Scranton Electric Company.

ADSCO low pressure steam lines installed for Western Public Service Co., at Scotts Bluff, Nebr.

ADSCO 16 in. low pressure and 8 in. high pressure with 6 in. return, installed at Rochester, N. Y., for Rochester Gas and Electric Corp.

Great Activity in District Heating by Public Utilities

GROWING appreciation by Public Utility Corporations of the profitability of District Heating is responsible for its rapid extension as a utility service.

Electrical executives are now studying the profit possibilities of coordinating District Heating with their present operations.

ADSCO Underground Steam Distribution effects tremendous economies in industrial plants, colleges, hospitals and other groups of buildings where one boiler plant serves for all buildings.

Illustrated here are some of the more recent operations planned by ADSCO engineers and equipped with ADSCO products — casing or multi-cell conduit, expansion devices, gate valves, steam traps, reducing valves and meters.

Every year the demand for ADSCO service and ADSCO equipment increases with the growing appreciation of district heating as a modern, economical and efficient method of heat distribution.

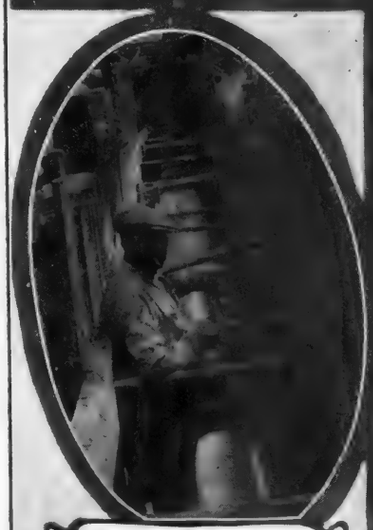
Inquiries invited on proposed District Heating Projects.

AMERICAN DISTRICT STEAM COMPANY

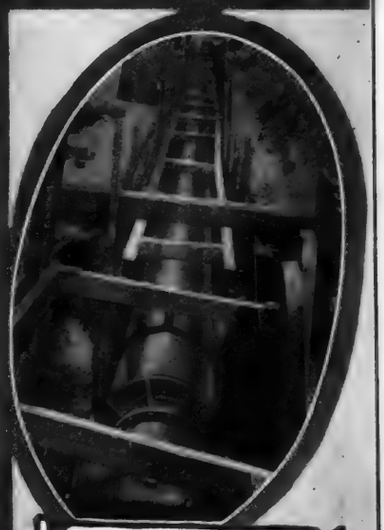
GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

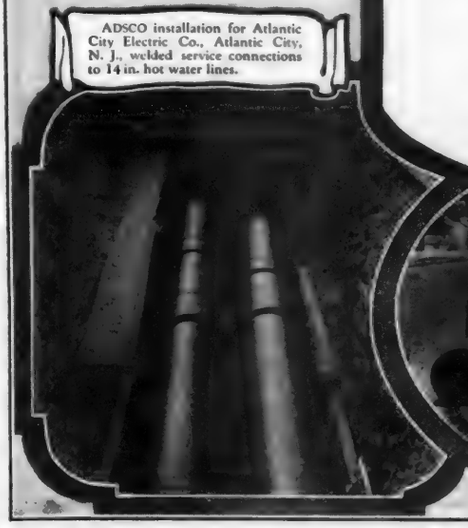
Branches and Agents in Principal Cities



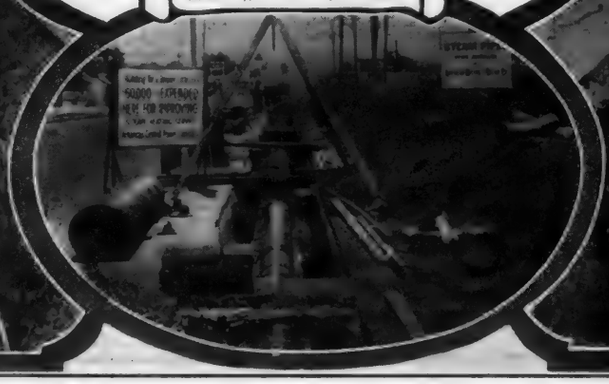
ADSCO 10 in. low pressure mains in multi-cell tile and expansion joint construction for Iowa Ry. and Light Corp., Cedar Rapids, Iowa.



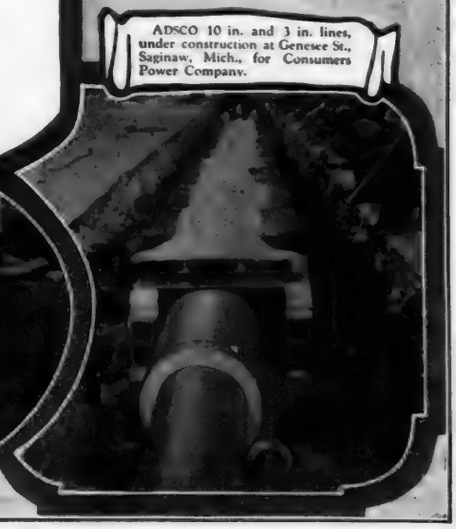
ADSCO casing construction, used in 16 in. welded line at Grand Rapids, Mich., for Consumers Power Company.



ADSCO installation for Atlantic City Electric Co., Atlantic City, N. J., welded service connections to 14 in. hot water lines.



ADSCO 20 in. main with multi-cell tile conduit, installed for Arkansas Central Power Company, at Broadway, Little Rock, Arkansas.



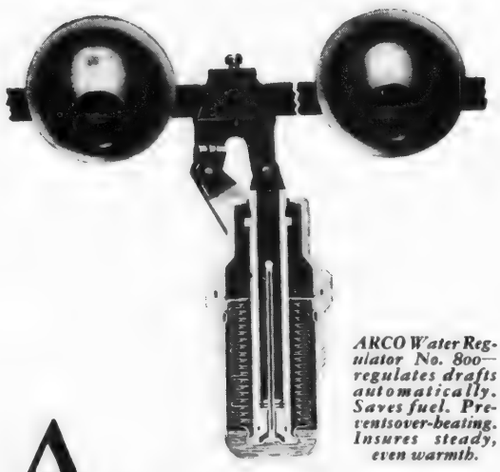
ADSCO 10 in. and 3 in. lines, under construction at Genesee St., Saginaw, Mich., for Consumers Power Company.

ARCO

Modernize Heating Plants with

ARCO WATER REGULATOR

and make extra profits



ARCO Water Regulator No. 800—regulates drafts automatically. Saves fuel. Prevents over-heating. Insures steady, even warmth.

ARCO Water Regulator No. 800 offers you a source of extra profits that you cannot afford to pass up.

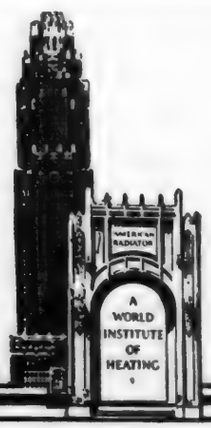
Every home that is still handicapped with the inconvenience and nuisance of manual control should have an ARCO Water Regulator. And you will sell an ARCO Water Regulator in that home when you but mention to the owner how this Automatic Damper Regulator will do away with the annoyance of constantly adjusting drafts and dampers—the inconvenience of endless stair-climbing.

And—here is a most convincing sales point—the ARCO Water Regulator in the long run costs the purchaser nothing, because it pays for itself again and again in fuel savings alone.

You do not need us to point out to you that wherever you sell an ARCO Water Regulator—there you will have a friend and "booster"—because of the growing satisfaction of that customer as he and his household experience the comfort and convenience of the ARCO Water Regulator—month after month—winter after winter.

Modernize every heating plant in your community with ARCO Water Regulator No. 800—and make more money.

Don't overlook the No. 800 ARCO Water Regulator's "small brother"—No. 801 for tank heaters. Same principle of operation. Same opportunity to bring additional convenience to home-owners of your community. And another source of business for you.



AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION

816-820 South Michigan Avenue Chicago, Illinois

Makers of:—

AIRID AIR VALVE No. 500

ARCO PACKLESS VALVE No. 988

ARCO WATER REGULATOR No. 800

DETROIT EQUALIZING VALVE No. 104

MERCOID CONTROLS

An Unparalleled Achievement

in Ventilation Engineering!

The Holland Vehicular Tunnels

Chief Engineers,
Clifford M. Holland
Milton H. Freeman
Ole Singstad

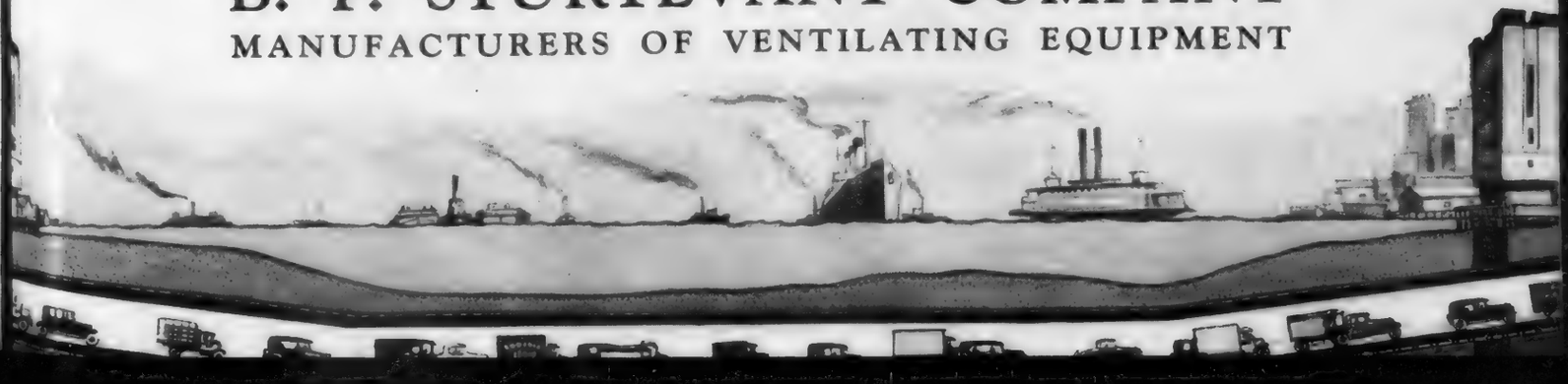
Cost of Tunnel, $48,000,000
Capacity, 46,000 vehicles a day
Construction Time, 7 years
Length, end to end, 9250 feet
Ventilated by, 84 Sturtevant Blowers and Exhausters, handling 1400 tons of air a minute

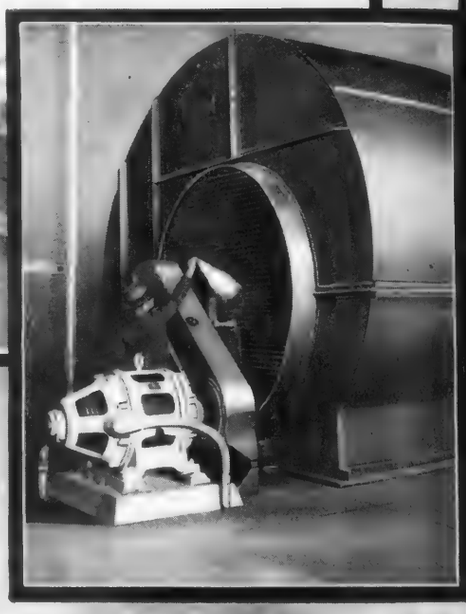
Sturtevant

REG. U. S. PAT. OFF.

B. F. STURTEVANT COMPANY

MANUFACTURERS OF VENTILATING EQUIPMENT





Holland Vehicular Tunnels
World's Biggest Ventilating Job!

Sturtevant's Engineering Contribution to this gigantic accomplishment ~ ~ ~

BUILT at a cost of $48,000,000, and now completed after seven years of labor, The Holland Vehicular Tunnels, dipping deep under the Hudson River and linking New York and New Jersey, aptly have been called "the eighth wonder of the world".

9,250 feet long, accommodating 46,000 vehicles a day, these tunnels presented a ventilating problem without precedent. With thousands of cars discharging smoke, fumes and lethal carbon monoxide gas—with the ever-present danger of a car catching afire—with the safety of thousands in the balance every day—how could absolute safety be assured? This was the question that had to be answered.

To cooperate with the tunnel engineers in solving this problem has been Sturtevant's privilege from the very beginning. In the Sturtevant Research Laboratory many perplexing questions were settled. Here, and throughout the many months of planning and construction, Sturtevant was given the opportunity to bring into play its many years of engineering experience.

The 84 Sturtevant Blowers and Exhausters that keep the tunnel air safe and pure tell another story of engineering achievement. These giant fans are capable of handling 1400 tons of air per minute and effect in each tube 42 changes of air per hour. Sturtevant in winning the order for these fans not only met the exacting specifications but, in addition, met them with a power consumption 15% less than that required by its nearest competitor!

* * * *

B. F. Sturtevant Company, Hyde Park, Boston, Mass.

Plants:

Hyde Park, Mass. Framingham, Mass. Camden, N. J.
Sturtevant, Wisc. Berkley, Calif. Galt, Ontario

Branch Offices in Principal Cities

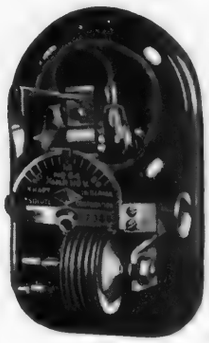
Sturtevant

REG. U.S. PAT. OFF.

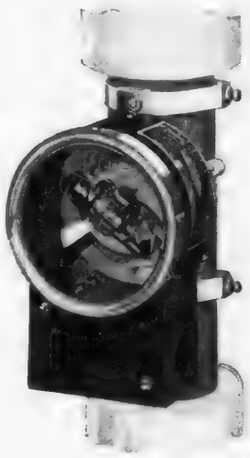
VENTILATING, HEATING, AND POWER PLANT EQUIPMENT

CON-TAC-TOR

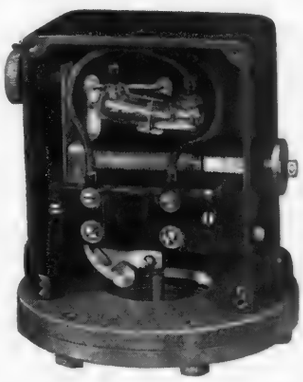
Get ALL the Good from Unit Heaters



At the left is illustrated (without cover) our No. 64 Thermoswitch, operating on room temperature. Where appearance is of less importance, our No. 26AR Convoswitch is equally satisfactory and less expensive.



No automatic control is complete without a limiting control, such as the No. 56R Aquaswitch shown at the right. This is used on either hot water or steam systems, and prevents the fan from starting unless the supply pipe is hot. It is also built for mounting on horizontal pipe.



For steam systems, the No. 33R Pressureswitch, presented to the left, prevents operation of the unit heater unless adequate steam pressure is available. The operation of all of these controls is completely automatic.

THE Unit system of heating makes possible new economies in heating and greater working efficiency. These possibilities are seldom achieved, however, unless the heaters are automatically controlled.

Who can be held responsible for turning off the heater in each room or department when the temperature is sufficiently high? Will the heater be turned off or will the windows be opened? Or who can be depended upon to turn it on again when needed? Will each operation require a convention of employees to determine the necessity and appoint an executive? Maybe they'll just open the windows.

For a surprisingly small expenditure you can make certain that room temperature will not be a disruptive factor among employees, and can be sure that your heaters will operate when, and only when, they are needed.

If you want heating efficiency, investigate the possibilities of Con-Tac-Tor Controls.

USE THIS COUPON

GENTLEMEN:

Without obligation on my part, please send me your Unit Heater information.

Name .....

Street .....

City ..... State .....

HV1227

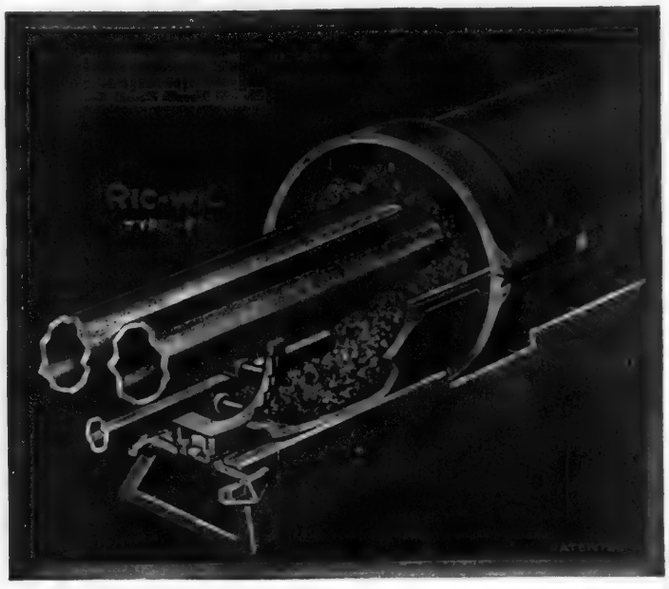
ABSOLUTE CON-TAC-TOR CORPORATION

Automatic Electric Controls

ELKHART, INDIANA

SEE OUR EXHIBIT AT THE NEW YORK POWER SHOW, BOOTHS 737-738

Only Ric-wiL Gives You These
7 Underground Conduit Advantages



1. A Base Drain that guarantees safe, adequate, immediate drainage, that costs less installed than round drain.

2. A conduit with Loc-lip Side Joints which absolutely seal the split sides and lock top and bottom halves together. Easily inspected. Water-tight.

3. Pipe supports that carry pipes independent of the conduit and that are quick and easy to install.

4. Four types of insulation, including Ric-wiL Dry-paC Filler, to meet every condition.

5. Cast Iron Ric-wiL for extra heavy duty to eliminate special re-inforced concrete construction.

6. A compact, interlocking construction throughout that assures permanent dry efficiency.

7. Such savings of labor, trenching and extra materials that Ric-wiL costs no more, and often less, than ordinary or field built conduits.

These advantages, the results of progressive modern engineering, only Ric-wiL gives you. Be sure to get full information and estimates on your next job.

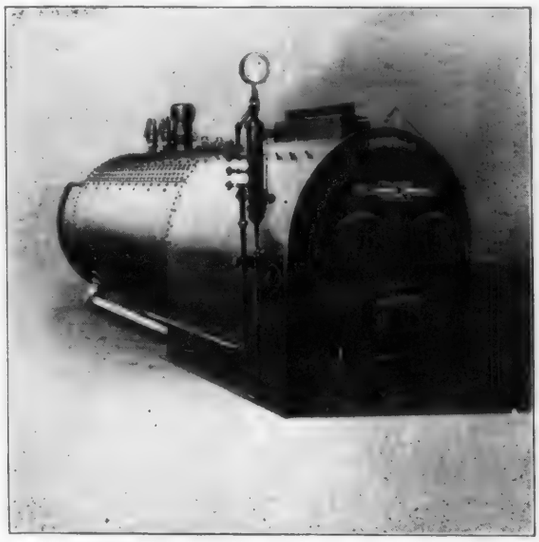
THE RIC-WIL COMPANY

Originators of Waterproof Conduit Filler

1567 Union Trust Bldg. Cleveland, Ohio

RIC-WIL

UNDERGROUND CONDUIT



Economical

ECONOMY starts with installation. No external brick work—a low water line which permits installation in shallow cellars or with a minimum of excavation.

ECONOMY demonstrates itself in operation, in quick steaming, in rapid water circulation, low stack temperature, almost perfect combustion and efficient use of more B.T.U.'s.

ECONOMY continues throughout the long, long life of a Stanwood in less necessity of cleaning, easy, quick cleaning when it is necessary, freedom of repairs to crown sheets, mud legs and exposed circumferential seams because there are none.

Every engineer and business official interested in economical and efficient boiler operation should send for an explanation of the 17 elements of Stanwood Boiler superiority.

Regularly built in sizes from 29 to 250 H.P. (3,500 to 31,000 sq. ft. steam radiation). Built for higher pressures to order. Write Dept. D-127 for latest catalog.

ALL STEEL RIVETED CONSTRUCTION

Stanwood Smokeless Boilers

THE STANWOOD CORPORATION

Manufacturers of Smokeless Boilers, Horizontal Return Tubular Boilers, Stacks, Breechings, Tanks, Feed Water Heaters and Throttling and Automatic Steam Engines.

Established 1891 CINCINNATI, OHIO

THE STANWOOD CORPORATION, Dept. D-127
Cincinnati, Ohio.

Please send me pamphlets describing in detail the Stanwood Boiler.

Name .....

Business .....

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The ONLY air

ACE

AIR FILTER

One of 4 ACE Units installed at General Motors Corp. Total Capacity 30,000 C.F.M.

Unit of the ACE Installation, Cincinnati Masonic Temple. Total Capacity 280,000 C.F.M.

Engineering and Laboratory Service

We are prepared to co-operate with engineers, architects and prospective customers in solving their dust removal problems. To this end we offer, gratis, the services of our experienced engineers and the use of our laboratory.

Wherever your building or factory may be located, we will gladly make a study of your conditions and conduct tests, and give you definite guarantees on what the ACE Filter will do for you in the way of purifying the air for ventilating, drying or other purpose.

filter combining ALL these vital features

1 Fully Automatic

ACE is the only filter of the desirable stationary type that is entirely automatic, fully completing entire cycle of performance without attendance. Not only washes dirt from filter media, but also removes it from oil reservoir and ejects it into a small mud basket. About once a month the mud basket is dumped. Can be emptied as easily as a waste paper basket, without soiling the hands. No elaborate strainers to clean. No draining of oil reservoir. No bulky pans to empty. No dirty, undesirable cleaning jobs of any kind. This insures continuous proper operation in service.

2 Maximum Flushing Effect

ACE is so designed that oil is delivered over smallest cross section of filter surface. This results in greatest flushing effect per gallon in unit time. Entire flushing operation is completed in only 7 minutes, once a day.

3 Most Thorough Flushing

Design of ACE filter media overcomes tendency of oil to flow in streams and provides a uniform flow over entire filter surface. ACE is the only filter in which every square inch of surface is flushed uniformly and simultaneously. This eliminates need for an intricate flushing mechanism. Flushing is done automatically every 24 hours. This frequent cleaning insures complete removal of dirt.

4 Most Efficient Filter Media

Vertical grooved and slitted baffles (patented), closely spaced in two stages, completely remove dirt from air, including the very light particles. No complicated moving or rotating parts. No mesh or criss-cross formation for the inevitable lint to collect on and mat, making automatic removal impossible. No projections for globules to form on, and hence no blowing over of oil into air ducts.

5 Resistance to Air Remains Constant

Because of thorough flushing there is no constantly growing collection of muck on filter surfaces, increasing resistance to air flow. ACE resistance remains constant throughout its life, conserving power.

6 Low Erection and Maintenance Cost

ACE is simple, compact and rugged. Erection and maintenance costs are the lowest possible.

A careful study of ACE features will show conclusively that in its design all filter problems have been thoroughly analyzed and ingeniously mastered.

Full details are contained in ACE literature. The coupon below will bring this matter to you.

General Air Filters Corp.

Division The W. B. Connor Co. Inc.

367 Lexington Ave., New York.

Mail this coupon now

COUPON

THE W. B. CONNOR CO., INC.,
367 Lexington Ave., New York.

Date..... .....

☐ Please send me your literature on the ACE Filter. We are interested in clean air for the following purpose:

VENTILATION	FILTERING
☐ General, for Buildings	☐ Air for Compressor Intake
☐ for Electric Motors	☐ Air for Internal Combustion Engine Intake
☐ for Electric Generators	
☐ for Electric Transformers	☐ Air for Process Work

Name:..... Company:.....

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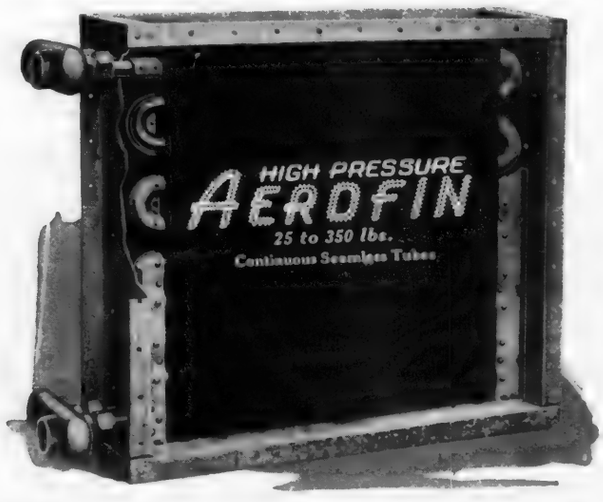
The 7 prerequisites of the ideal Fan System Heating Surface and how AEROFIN approaches that Ideal!

1. Non-Corrosive 2. Light Weight 3. Compact
4. Strong and Durable 5. High Heat-transmitting Capacity
6. Encased Unit Design 7. Ease and Economy of Installation

3-COMPACT Aerofin has literally revolutionized Fan Engineering! It has permitted important improvements in the design of Heating Systems of every description, and in Air Conditioning. Not only this, but compact Aerofin has fostered the development of many *entirely new* methods of heating and cooling. It is the heart of many amazingly compact, light Unit Heaters which, suspended overhead, out-of-the-way, provide economical, uniform, zone-of-occupancy heating, heretofore but a cherished dream. And in central Fan Systems the ease with which compact Aerofin booster or control Units may be installed in separated places, has brought a new era in design.

In special equipment, like the remarkable Gordon Regenerative Dryer, for instance, compact, integral Aerofin has fathered completely standardized, self-contained design and increased the range of steam pressure to 350 lbs., affording operating temperatures up to 500° F.

The possibilities of Aerofin challenge the greatest ingenuity of the Architect, the Engineer, the Contractor.



A new Bulletin, No. 7, affords a complete description of Low Pressure Aerofin and presents eighteen Piping Diagrams in four colors, representing the coordinated experience of the foremost Engineers in the United States.

Bulletin H. P.-1 describes High Pressure Aerofin and contains complete Technical Data with large Temperature Effects Chart on linen.

Either or both of these Bulletins will be mailed, gratis, to recognized firms or individuals, upon request.

AEROFIN CORPORATION

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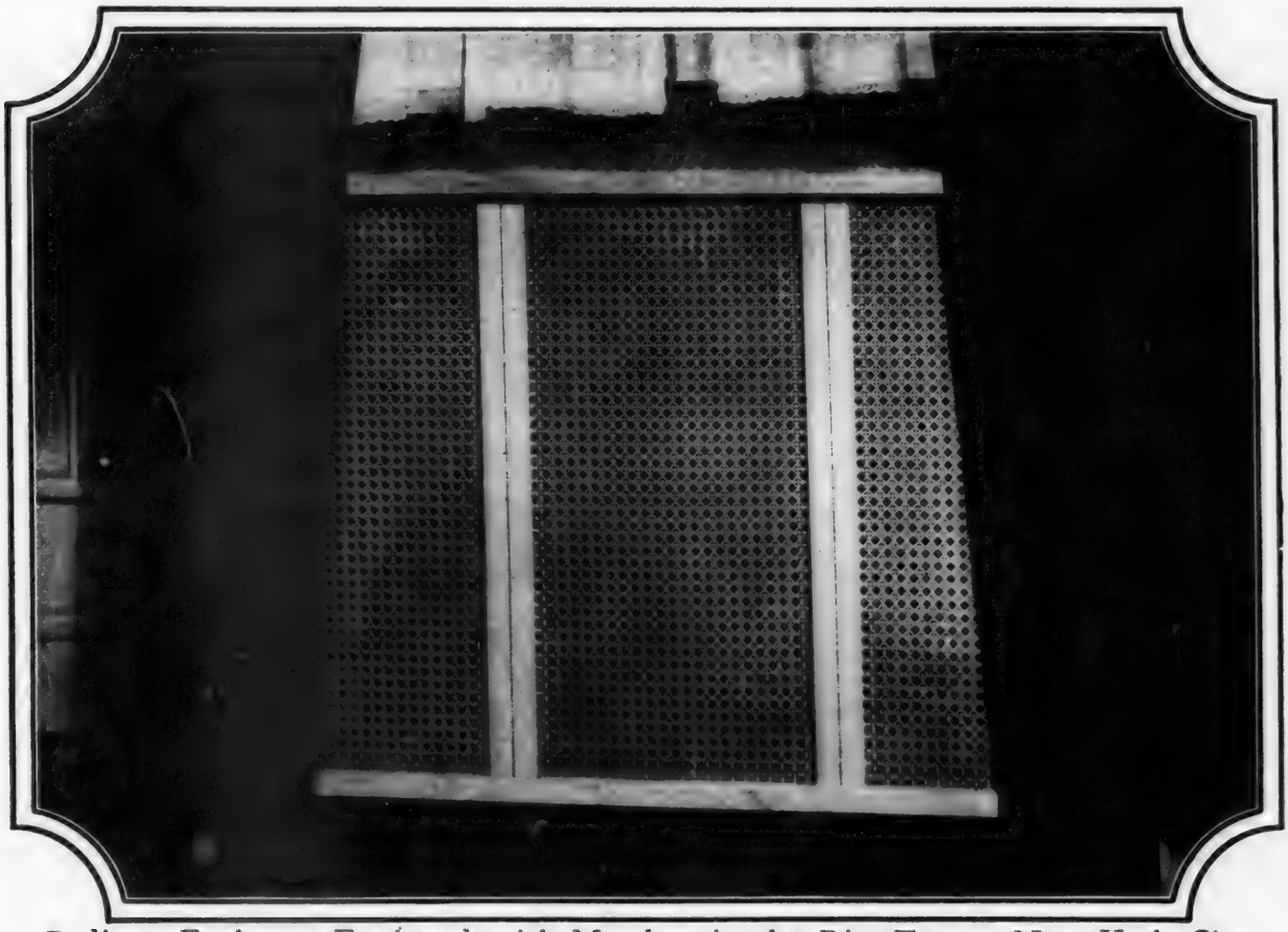
AEROFIN is sold only by Manufacturers of nationally advertised Fan Heating Apparatus

Whatever you've wished for in a Fan System Heating Surface you'll find in Aerofin!



Radiator Enclosure Equipped with Metalace in the Ritz Tower, New York City

EMERY ROTH, Architect TODD ROBERTSON & TODD ENGINEERING CORPORATION, Builders

Throughout this Country and Abroad Metalace is the Standard for all Forms of Radiator Enclosures and Heating Installations

Write for Illustrated Catalog with New Metalace Patterns in steel or bronze

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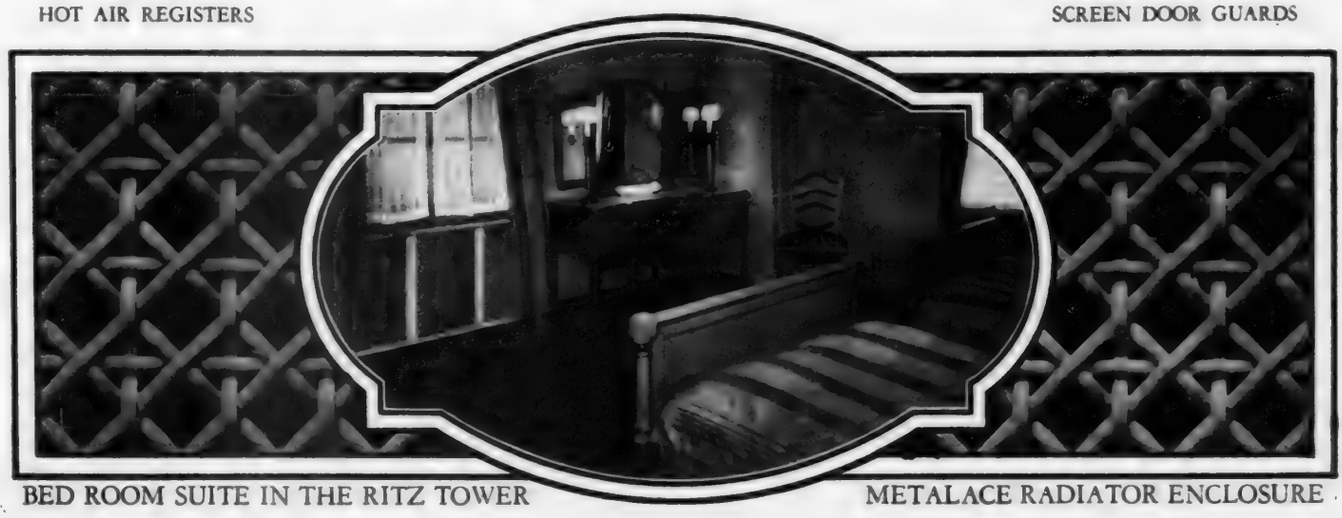

BED ROOM SUITE IN THE RITZ TOWER METALACE RADIATOR ENCLOSURE

UNIVENT and Glass—*make the difference*

TO TRY to ventilate the office building through open windows has proven futile. On still days little air comes in. On other days blustering winds bring in smoke, soot, snow and the distracting noise of a great city. As the lesser of two evils windows are closed, and the workers suffer the inevitable results of stuffy air: lassitude and lowered efficiency.

The Univent solves the problem. It brings into the office outdoor air, cleans it, heats it when necessary, and diffuses it to every nook and cranny of the room—with invigorating air motion, but without draft.

No 4 o'clock let down, no fluttering papers, no cold inducing drafts—winter or summer—in the Univent-ilated room.

Labor—either mental or physical—is the most expensive thing in the world. Eliminate mistakes—keep employees healthy and productive by giving them the invigorating air conditions that keep everyone from executive to office boy mentally and physically alert.

*Union Electric Light & Power Bldg., *equipped with . . .*

UNIVENT (TRADE MARK)

VENTILATION

The Univent is not an exhaust system—it is real outdoor ventilation indoors—with dust and noise left out.

Architect and heating engineer should know why the Univent is endorsed by building managers, business executives, and school authorities for its economy, flexibility, and ease of control. A request on your letterhead for Architect's Edition of "Univent Ventilation" will bring you some interesting facts.

* * *

**Union Electric Light & Power Bldg.*
St. Louis, Mo.
Partnership Estate of Albert B. Groves, Deceased; A. A. Aegerter, surviving partner

Manufactured only by THE HERMAN NELSON CORPORATION, *Moline, Ill.*

Builders of Successful Heating and Ventilating Equipment for 20 Years

Sales and Service

BELFAST, ME.	SYRACUSE	PITTSBURGH	CLEVELAND	CHICAGO	BIRMINGHAM	KANSAS CITY	SEATTLE
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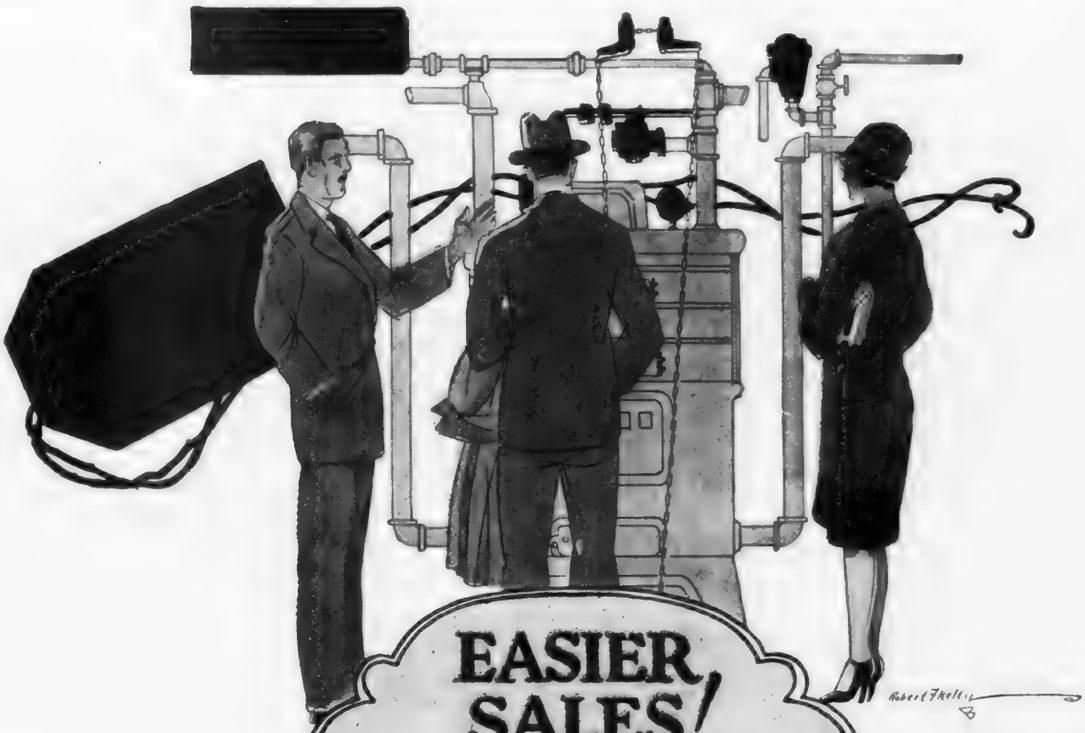
NEW YORK CITY	WASHINGTON, D. C.	SAGINAW	TOLEDO	MINNEAPOLIS	SAN FRANCISCO	SPOKANE	WINNIPEG, MAN.
UTICA	SCRANTON	DETROIT	INDIANAPOLIS	ST. LOUIS	EMPORIA	PORTLAND	



EASIER SALES! ..and here is the reason

THERE'S no trick about selling a Hot Water Heating job Thrush Equipped ☆ The added convenience of the Thrush regulation is a definite contribution to home comfort ☆ The safety is positive ☆ Economy of fuel consumption is startling as compared to gravity, hot water, or other forms of heating ☆ The installation cost is lower than for the ordinary expansion tank and reduced pipe sizes completely offset the cost of the Thrush System. ☆

Added Equipment that Costs the Owner Nothing!

It's true! You can offer a Thrush Equipped Hot Water Heating job—*a closed system with higher efficiency, plus automatic regulation*—at no higher cost than your competitor asks for a gravity job without any regulation at all ☆ Isn't that a wonderful selling argument? ☆ Can't you build volume and profit with equipment that costs nothing more than the ordinary equipment which it replaces, yet pays you a greater profit, reduces your installation costs and wonderfully improves operation? ☆

Better Heating that Brings New Friends

Best of all, every Thrush Equipped Hot Water Heating plant that you sell is *a continuous advertisement for your service* ☆ It makes a friend for you and these friends tell their friends and establish new prestige for your business ☆

This isn't theory for thousands of jobbers and dealers everywhere have proved it beyond question of doubt ☆

Thrush Equipment can be put on old or new plants to convert a gravity job into a closed or pressure system with the tank in the basement and automatic regulation of dampers ☆ The compact installation all goes on or near the boiler, requiring only six feet of pipe and seven connections ☆

Ask Your Jobber About It

Thrush System is sold by good jobbers throughout the United States and Canada ☆ Ask your jobber's salesman to tell you about the Thrush plan for helping dealers sell—or mail the coupon below and we will have your jobber tell you about it ☆

THRUSH SYSTEM
OF HOT WATER HEATING

New Homes or Old—

MAIL THIS COUPON!

H. A. THRUSH & CO., Peru Indiana

Gentlemen: Please send me illustrated catalog and other data on Thrush Equipment and tell me about your advertising and selling helps for dealers.

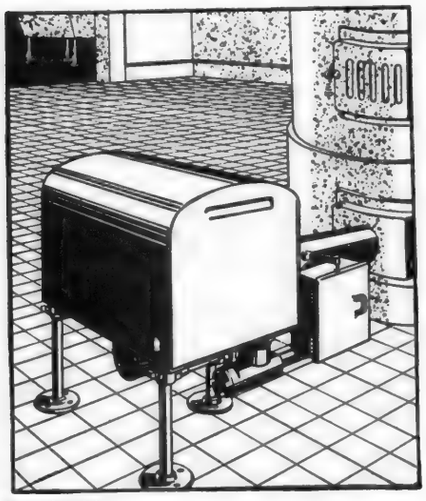
*Name*_____

*Address*_____

*My Jobber is*_____

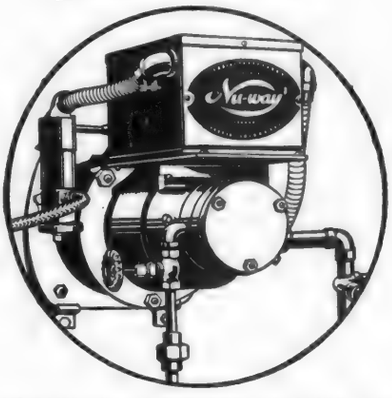
They're Prospects

Nobody need be without a NU-WAY



Listed as Standard by Underwriters' Laboratories.

There's a size for every pocketbook



YOU can sell your prospect the exact sized burner needed for the job. The Nu-Way engineering organization has devised a range of sizes which makes it possible for people of modest means to have the same Nu-Way comforts that are enjoyed by owners of large establishments. Prices are in proportion to size. Don't make the expensive mistake of discovering Nu-Way too late. Let us show you the interesting features which make this time-tested oil burner the undisputed model of simplicity, quietness and economy. (Nu-way burns the cheapest grades of oil.) Prices from $200 upward.

MEMBER OIL HEATING INSTITUTE OIL HEAT

NU-WAY

An Automatic OIL BURNER

Manufactured and Sold by

THE NU-WAY CORPORATION

ROCK ISLAND, ILLINOIS

A NEW method of merchandising oil burners

This new way of selling oil burners offers a rich opportunity to the right kind of men.

Are you the "right kind"? If you are tired of plugging along in a salaried rut; if you want to be your own boss; if you have the energy of youth (age does not matter); if you are eager to make from $3,000.00 to $10,000.00 a year; and if you are willing to work reasonably hard—then this ad is addressed to you.

Write us fully about yourself. Tell us what business and selling experience you have had and how long you have lived in your city. We promise to treat your letter confidentially.

AUTOMATIC BURNER CORPORATION
312 No. May St. Chicago

The ABC Oil Burner

Oil Burner Merchants *Now* Oil Burner Makers

President
A. E. MACINNIS
(President Power Plant Eng. Co., Seattle, Wash.)

Vice-Pres.
R. S. BOHN
(President Preferred Utilities Co., New York City; Director American Oil Burner Association)

Vice-Pres.
SPENCER A. MERRELL
(President Merrell & Co., St. Louis)

For the very first time, in the oil burning industry, successful oil burner merchants are oil burner manufacturers. The Hart Oil Burner factory is now operated by a group of distributors. Preferred Oil Burners, Inc., is the new company's name.

A. E. MacInnis is President. Mr. MacInnis is also President of the Power Plant Engineering Co., Seattle. His company sold 369 installations during April, 1926. During the same thirty-day period this year his company sold 614 installations. All records point to a similar increase for 1928.

Vice-President is R. S. Bohn, also Pres. of the Preferred Utilities Co., New York, and a director of the American Oil Burner Association. Mr. Bohn has one of the largest oil burner distributor organizations in the country.

Spencer A. Merrell, also Pres. of Merrell & Co., St. Louis, is Vice-President. He established a record by selling 49 oil burners in one month, single handed.

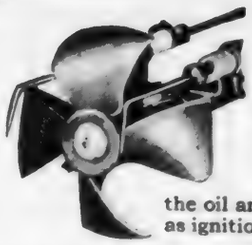
These men have prepared the most liberal dealer franchise in the industry—a franchise written by dealers, for dealers—one that provides for a good product, complete co-operation and satisfactory returns on your efforts.

In the Preferred-Hart, these men offer you a dependable automatic oil burner, simple to install, economical to service and fairly priced. With the Preferred-Hart franchise you are offered co-operation that has proved successful in making these men the outstanding oil burner distributors in the United States.

Lionel V. Tefft is secretary. J. Paul Schnellbacher, treasurer. These men are well known Peorians—the factory home. L. I. Aldrich is Chief Engineer of Preferred Oil Burners, Inc. G. W. Bohn, of Preferred Utilities Co., N. Y., and R. S. Whaley, of Power Plant Engineering Co., Seattle, are advisory engineers. All these (were photographs available) would be quickly recognized as nationally known figures through their meritorious mechanical contributions to the oil burning industry.

Preferred
PEORIA.

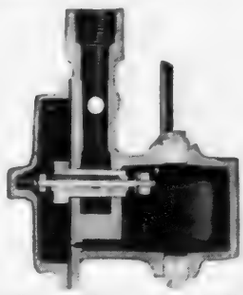
New Prices— Better Discounts



Electrodes need no service calls due to carbonization—they swing out of the oil and fire zone, as soon as ignition occurs.

Preferred-Hart list prices and discounts are new. The net effect is to give the dealer larger profits on a small stock. Discounts are governed largely by the dealer's own good judgment as to their selling ability and the number of burners their territory will absorb.

Policies

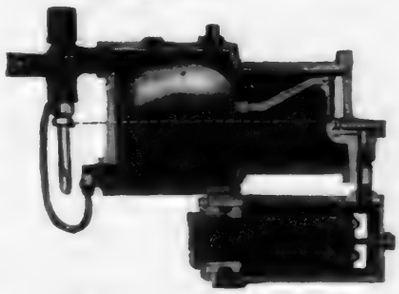


Preferred-Hart can't puff or flare back—this liquid trap drains the burner every time the burner stops.

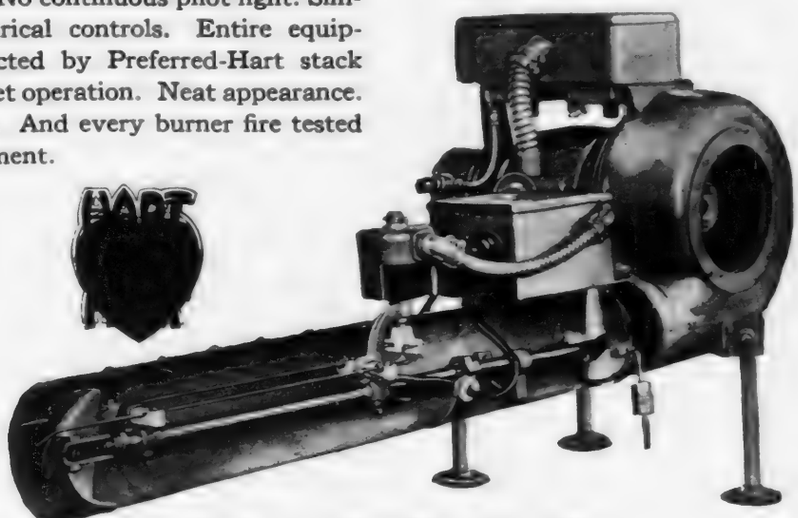
Increased Simplicity — Decreased Servicing

Add to Dealers' Profits

This is the profit-making—and profit-saving—line of oil burners for the dealer. Prôved in the field, through several heating seasons, these better burners possess many exclusive features that speed up sales and cut installation and service costs. The Preferred-Hart burns heavy or light oil, meeting oil conditions everywhere. Vacuum feed—no troublesome oil pumps. Complete atomization avoids smoke, soot, odor and carbon. Positive ignition without puff or flare back. No continuous pilot light. Simplified electrical controls. Entire equipment protected by Preferred-Hart stack safety. Quiet operation. Neat appearance. Right price. And every burner fire tested before shipment.



Vacuum tank is an anti-flooding device and syphon breaker. Takes the place of the customary oil pump and does away with automatic shut-off valves.



Study this sectional illustration of the Preferred-Hart Oil Burner.

Oil Burners, Inc.
ILLINOIS

Insist Upon Webster... The Nationally Known Transformer

You will but serve your own best interests when you insist that Webster Ignition Transformers be on every oil burner that you sell . . . Superior in design and performance and faithful in service, the Webster is widely recognized by many leading manufacturers as the outstanding oil burner ignition unit in the field . . . Its adoption as standard equipment on an ever-increasing list of oil burners has been due to five highly desirable features and a surprising absence of service requirements . . . Full details of its efficiency, economy and durability sent at your request

WEBSTER ELECTRIC CO., RACINE, WIS.
"Specialists in Oil Burner Ignition"

The Webster Ignition Transformer can be furnished with either single or double high tension terminals, 110 or 220 volts, 60 cycle, and 110 or 220 volts, 25 cycle.

Webster W Ignition Transformer

NO~Sundstrand is NOT "HIGH HAT"

SOME people say Sundstrand is "high-hat",—that Sundstrand picks and chooses Distributors and Dealers and seems in no hurry to obtain National distribution.

Now Sundstrand does pick and choose and is in no hurry because Sundstrand feels too keenly, responsibility to every one who installs a Sundstrand. But Sundstrand is NOT "high-hat".

It is no more likely that Sundstrand ever will be the largest oil burner manufacturer than Cadillac or Packard will be the largest motor car builder. Sundstrand is an engineering organization that has specialized in fine machinery building for 20 years. Today Sundstrand builds precision machine tools for 95% of America's fine motor car builders. And you can't have *two standards of quality* in the same plant.

So Sundstrand will continue to build up in the Oil Heat Generator the same high quality that has characterized Sundstrand Adding Machines, Bookkeeping Machines and Machine Tools. Parts of the Sundstrand Oil Heat Generator are machined to limits within .0002 of an inch, that's as close as fine motor practice.

Sundstrand Dealers have no Service Problem because the Sundstrand has less than half the parts common to the ordinary burner and its 22 working parts are *all* outside the furnace. Every part is so carefully made that the average Service cost per burner over a period of years has been less than $5.00 for a whole year.

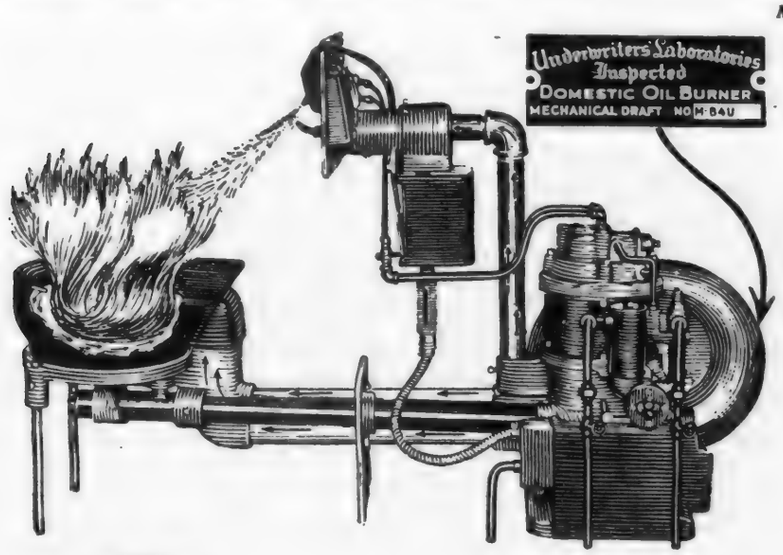
Sundstrand Dealers make money because of a Merchandising Plan that co-ordinates factory newspaper advertising, a direct mail campaign and salesmen's efforts into a close knit plan that insures *Profitable* Sales. As for margin, it's generous.

Sundstrand will be glad to send to representative merchants details of a Sales Plan that is giving every Sundstrand Dealer a handsome NET profit.

SUNDSTRAND ENGINEERING COMPANY

Dept. H-12 Rockford, Illinois, U.S.A.

Manufacturers of Precision Machinery Since 1905



REASONS WHY

Sundstrand Owners Boost

Absolute Dependability
Fifty Dollars Down Payment
Full Automatic Operation
Full Automatic Safety Control
Constant Electric Ignition
Quiet As A Mouse
Adjustments for Different Grades of Oil
Economical

GUARANTEED for 10 Years

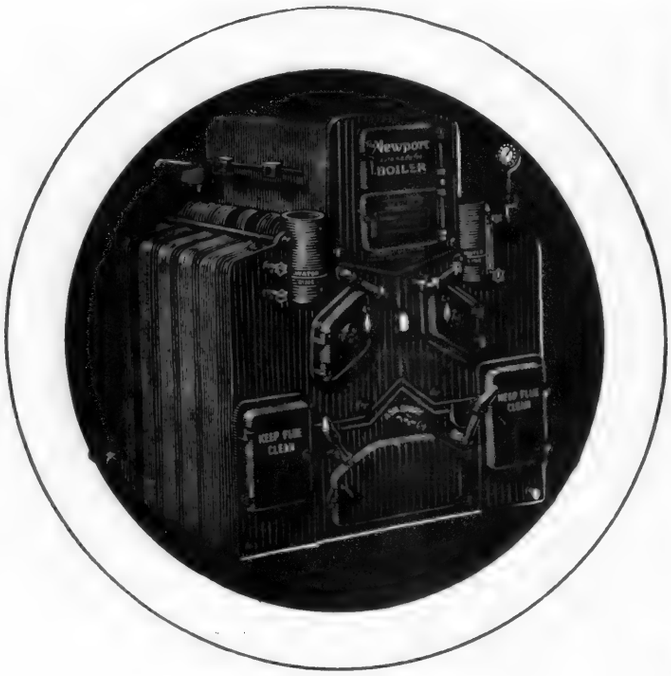
Sundstrand

Constant Electric Ignition

OIL HEAT GENERATOR

GUARANTEED FOR 10 YEARS

Important Combination of Interests Now Behind



NEWPORT
MAGAZINE FEED
BOILERS

Newport sales have trebled in the last two years. This increased popularity is due to the greater convenience, economy and satisfaction offered the owner in the Newport Magazine Feed Boiler. A booklet—"The Practice of Scientific Heating"—has been prepared especially for builders and heating and plumbing contractors. A request will bring it without obligation.

WE take great pleasure in announcing the further expansion of our manufacturing and distributing facilities through a complete affiliation with the Hart Parr Company, Charles City, Iowa, a well established, financially strong, successful manufacturer of quality products, who has enjoyed an international reputation for more than a quarter century.

A desire to augment their original interest in our company, prompts the placing of extensive facilities and resources squarely and securely behind the Newport Boiler.

Combined interests now permit us to extend our usefulness to new and greater fields and to serve the heating fraternity better than ever before.

This new affiliation in no way changes the personnel of the Newport organization.

NEWPORT
BOILER COMPANY

General Offices:
529 S. FRANKLIN ST.
CHICAGO

Distributors in all Principal Cities in U. S. and Canada

A HARDINGE FRANCHISE

AND YOU WILL BE

HEADQUARTERS

FOR FUEL OIL HEAT

BUNGALOW
8 ROOM HOUSE
10 ROOM HOUSE
14 ROOM HOUSE
2 FLAT BUILDING
3 FLAT BUILDING
6 FLAT BUILDING
12 FLAT BUILDING
24 FLAT BUILDING
36 FLAT BUILDING
HOTELS
CLUBS
THEATRES
BANKS
GARAGES
CHURCHES
SCHOOLS
HOSPITALS
GREENHOUSES
OFFICE BUILDINGS
INDUSTRIAL PLANTS
SKYSCRAPERS

With a Hardinge franchise your field has no limitations except those you, yourself, impose. You will have a *complete* line. You will be able to handle any heating problem efficiently, equip any building from bungalow to skyscraper, with Hardinge's two models in 12 different sizes and combinations. The Hardinge line has been a life line to many oil burner dealers. There is profit in the Hardinge franchise.

If you are a substantial dealer and you are being held back by an incomplete line, you can take a step to free yourself by writing for details of our dealer proposition. We cooperate in every way with Hardinge dealers.

The latest sensational addition to the Hardinge line is Model O, Combination No. 1 burner, living-room thermostatic control, 10-year guarantee—the same Hardinge performance known to thousands.

WITHOUT TANKS

$495

RETAIL

Hardinge Brothers, Inc.

Manufacturers of Precision-Built Machines for 37 Years

Factory and General Offices:
4149 Ravenswood Avenue
CHICAGO, ILL.

Factory Branches:
CHICAGO
Michigan Ave. at Ohio St.
BOSTON
839 Beacon Street

MEMBER OIL HEATING INSTITUTE
OIL HEAT
AS BENEVOLENT AS SUNSHINE

You can safely have confidence in the —

HARDINGE
FUEL OIL BURNER

Lad talks in parables.

"Here, Lad—

you claim that the Lincoln people have hit on a wonderful idea in motor construction. How come that something new in a motor, one of the oldest and most thoroughly developed pieces of electrical apparatus, should so suddenly be discovered?"

"Easy, Pop—

stockings were invented in the eleventh century but they weren't discovered until the twentieth.

There have been too many cast iron petticoats on motors in the past—all following a rigid fundamentalism in design.

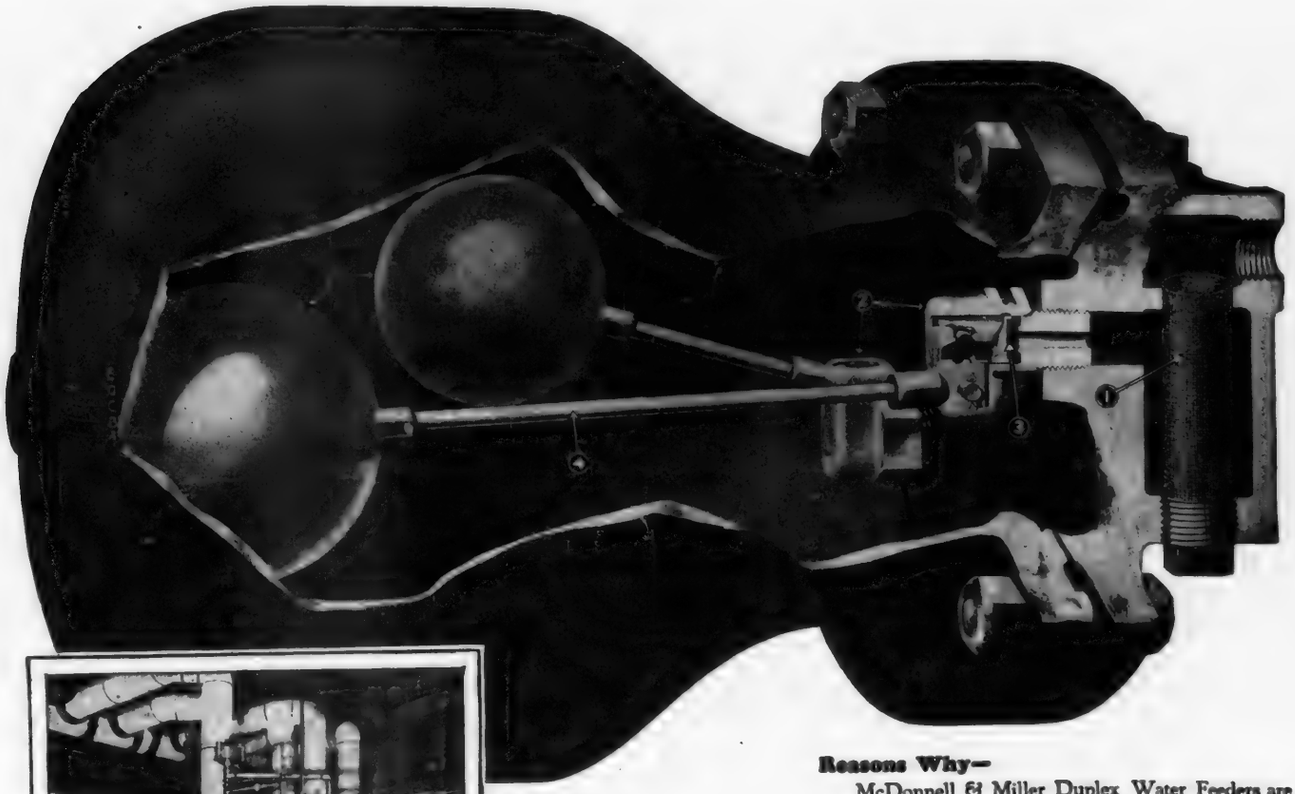
The Lincoln people in this 'Linc-Weld' motor got rid of cast iron construction—put in muscular shafts and masculine bearings to keep down bearing troubles—piled in plenty of active materials and better insulation. But they didn't make a new motor—just made it according to modern principles with a betterment of the older principles—pulled out the cast iron petticoats that warmed up the old motors—put in welded steel which let in the air. In other words, they gave the motor a chance to step—with pep."

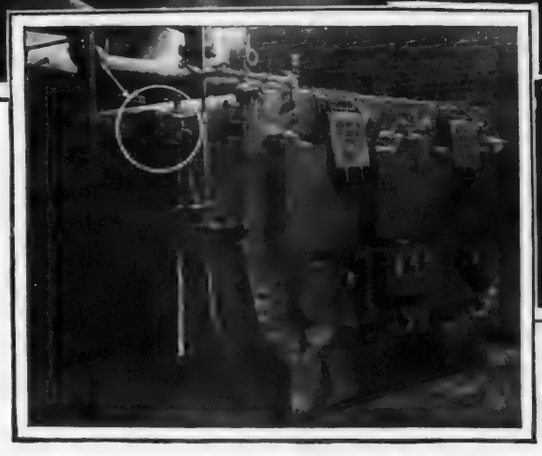
The Lincoln Electric Co., Dept. No. 16-12, Cleveland, Ohio

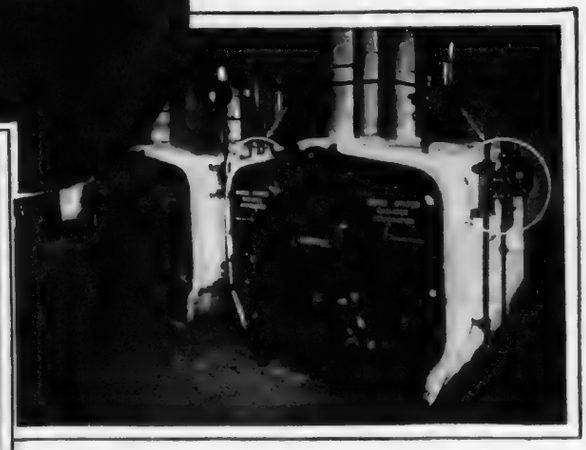
M-4

"Linc-Weld"

LINCOLN MOTOR







Reasons Why—

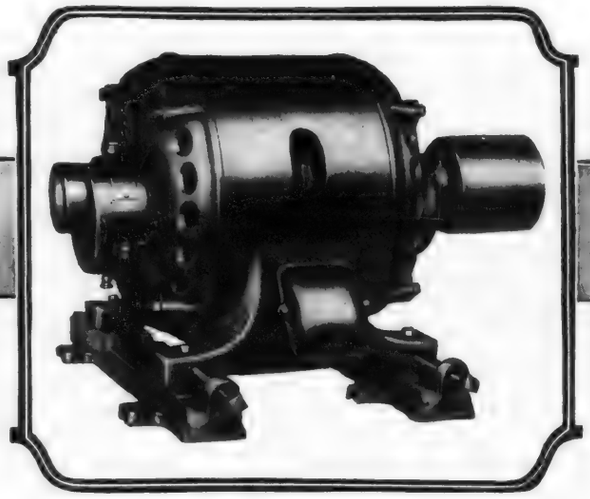
McDonnell & Miller Duplex Water Feeders are the accepted standard:

They are simple in construction.
They are dependable in operation.
They maintain boiler conditions which give highest efficiency.
They meet any unusual conditions encountered in the heating system.
They require no attention except annual cleaning.
They are less expensive than trouble.

McDonnell & Miller

General Offices • Wrigley Building • CHICAGO — NEW YORK • Grand Central Terminal

"They Keep



a-Running"

1 Horse Power Century Type SC Squirrel Cage Induction 3 and 2 Phase Motors

Century Wool-Yarn System of Lubrication

Protects Bearings Against Abrasion

The Century Wool-yarn System of Lubrication, standard on all one horse power 1800 R.P.M. and smaller Squirrel Cage Induction 3 and 2 phase Motors, completely filters all oil before delivery to the bearing surfaces . . . protecting them against abrasive wear. In addition, brass dust caps and collars placed in the bearing-housing openings makes them as dust-tight as is possible to build them . . .

1 . . Only continuous, unbroken strands of pure wool yarn are used . . . the highest grade of material available.

2 . . At least one year's continuous 24-hour-per-day operation is assured, without reoiling.

3 . . Oil is constantly delivered to the bearing surfaces by capillary attraction of the pure wool yarn.

4 . . Oil is conserved indefinitely . . . Leakage tendencies are eliminated because there is no drain plug at the bottom of the oil well.

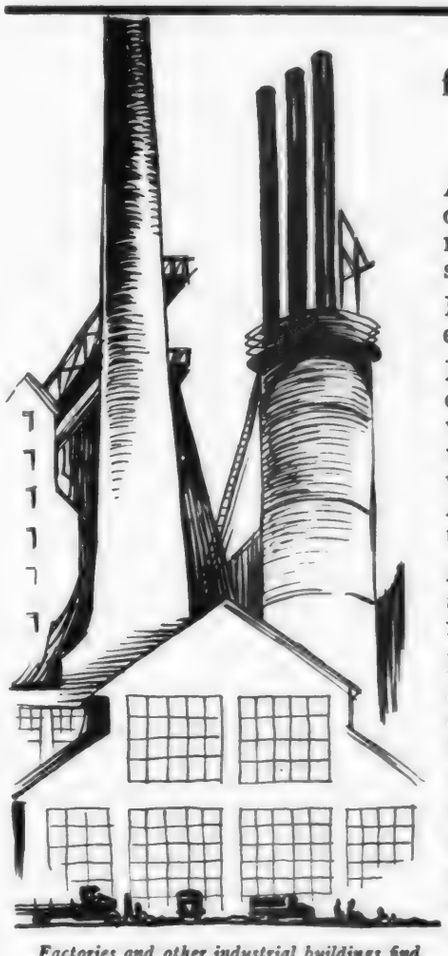
Century Type SC Squirrel Cage Induction 3 and 2 Phase Motors are built in all standard sizes from ¼ to 75 horse power . . . Temperature rise not more than 40° Centigrade.

CENTURY ELECTRIC CO. ✦ ✦ *1806 Pine Street* ✦ ✦ ST. LOUIS

33 Stock Points in the United States and More Than 50 Outside Thereof

¼ to 75 H.P. **Century MOTORS** ¼ to 75 H.P.

MERCOID
System of
DIRECT CONTROL



Factories and other industrial buildings find Mercoid-controlled unit heaters the ideal method of heating.

for POSITIVE CONTROL of UNIT HEATERS

Automatic control of unit heaters is out of the experimental stage and is now recognized as a reliable and desirable method of industrial heating.

Mercoid Thermostats permit the highest possible efficiency in this connection.

Mercoid Thermostats will automatically control motors of 1 h.p. or less, within guaranteed ratings, for normal working loads of 10 amperes at 110 volts, or 5 amperes at 220 volts, *either A.C. or D.C.*, thereby eliminating the use of relays or remote controls.

As a pilot switch, the Mercoid Thermostat may be used to control any size motor.

Regularly furnished with standard scale 56° to 80° F. with 2° markings and with a guaranteed operating differential of 2° at any point on the scale.

For lower temperatures, a range of 38° to 60° F. is available.

Furnished with a thermometer when specified.

Write for full information regarding Mercoid Thermostats for positive control of unit heaters.

Mercoid Thermostat—Figure 21. Standard range 56° to 80° F. Operating Differential of 2°.

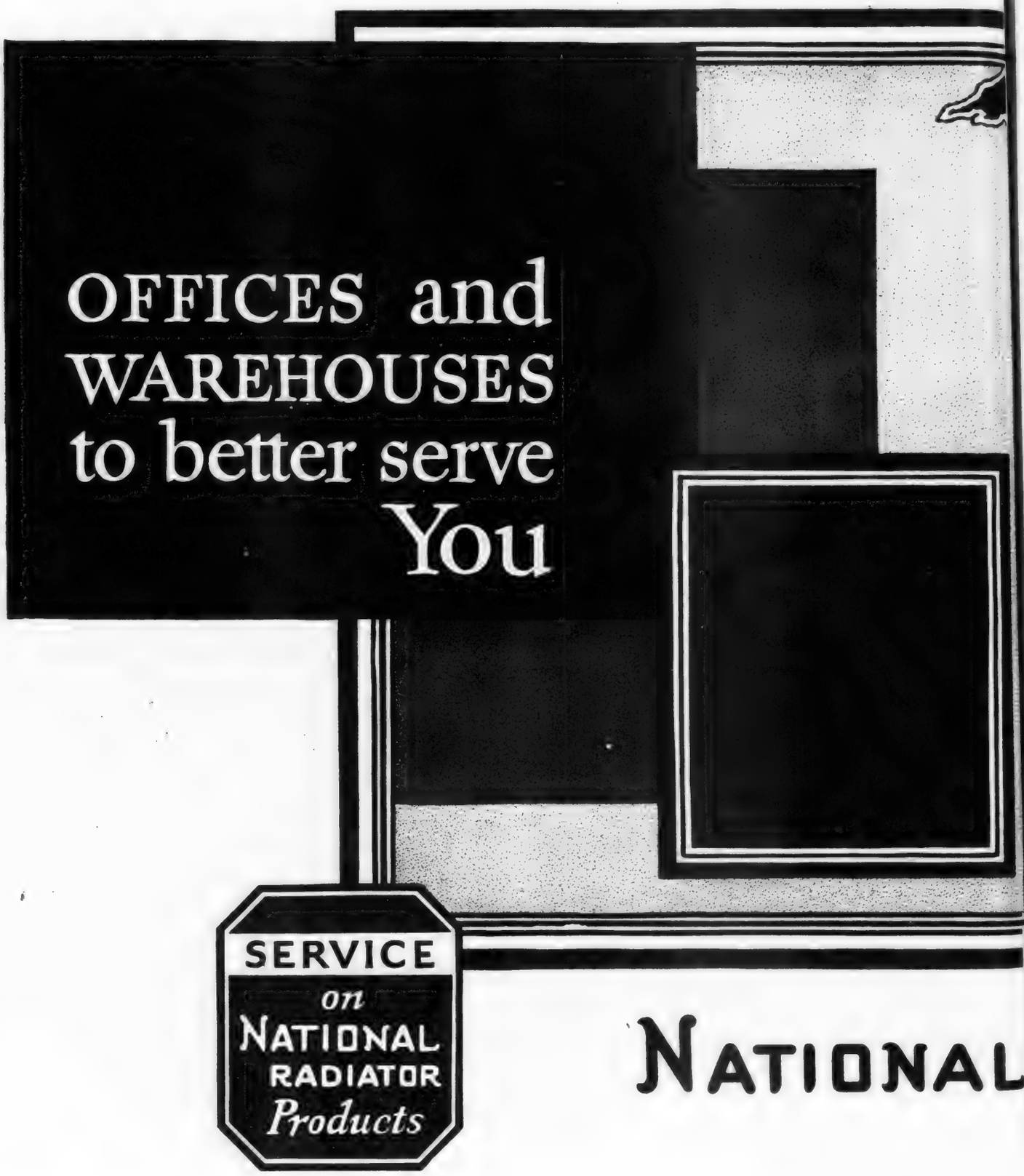
Mercoid Boiler Control—Figure 31. Pressure Type for Steam and Vapor Boilers

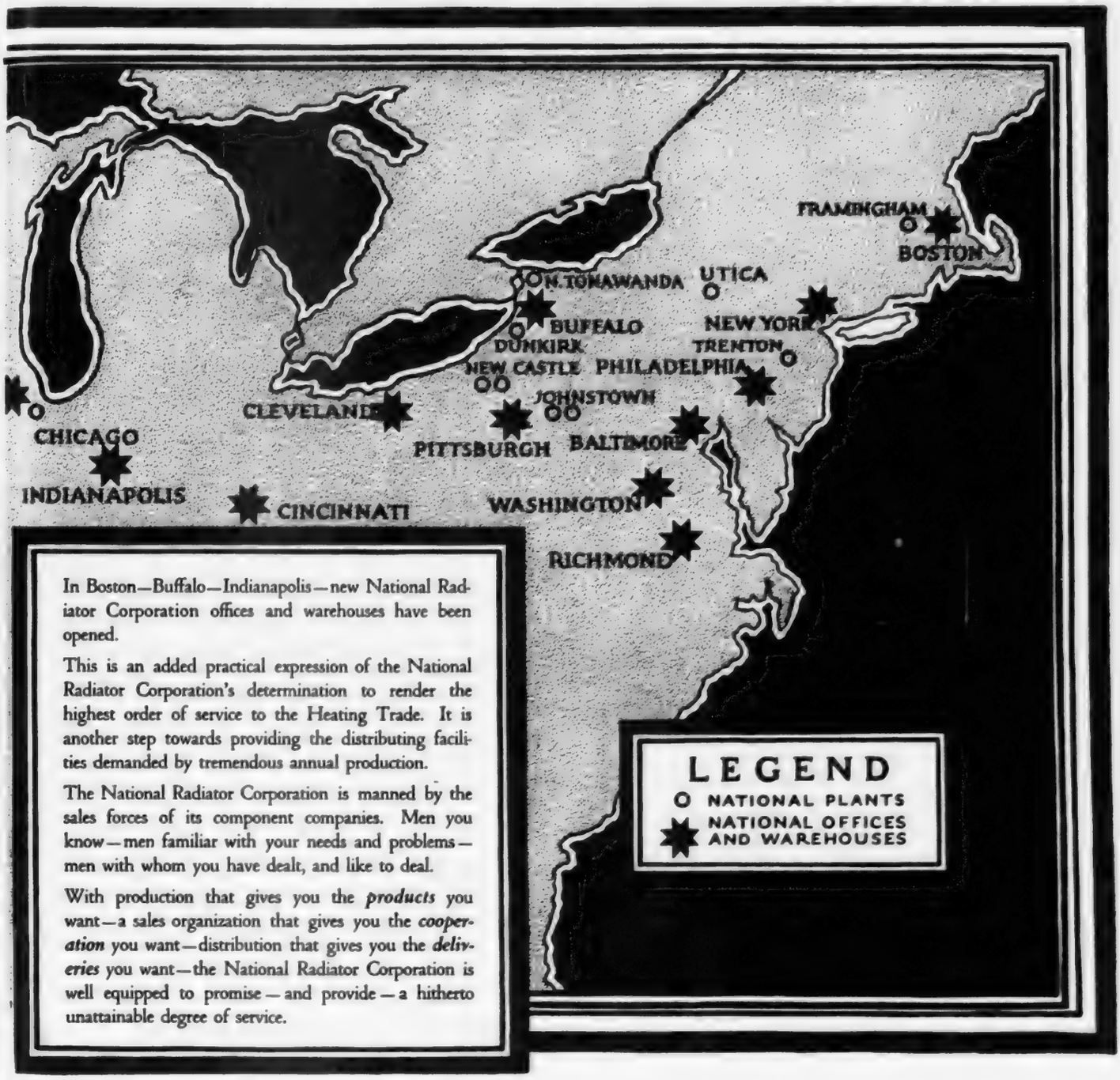
THE FEDERAL GAUGE COMPANY

564 West Adams Street
Chicago, Ill.

MERCOID

25 Church Street
New York City


OFFICES and
WAREHOUSES
to better serve
You
SERVICE
on
NATIONAL
RADIATOR
Products
NATIONAL



In Boston—Buffalo—Indianapolis—new National Radiator Corporation offices and warehouses have been opened.

This is an added practical expression of the National Radiator Corporation's determination to render the highest order of service to the Heating Trade. It is another step towards providing the distributing facilities demanded by tremendous annual production.

The National Radiator Corporation is manned by the sales forces of its component companies. Men you know—men familiar with your needs and problems—men with whom you have dealt, and like to deal.

With production that gives you the *products* you want—a sales organization that gives you the *cooperation* you want—distribution that gives you the *deliveries* you want—the National Radiator Corporation is well equipped to promise—and provide—a hitherto unattainable degree of service.

RADIATOR CORPORATION

Successor to

Continental Heater Corporation
Gurney Heater Manufacturing Company National Radiator Company
Niagara Radiator and Boiler Company
Union Radiator Company Utica Heater Company

Ten plants devoted to National Service through these Branch Offices and Warehouses:

Baltimore, Md.—2622 Frisby Street Boston, Mass.—93-97 Oliver Street Buffalo, N. Y.—McKinley Building, Delaware Avenue
Chicago, Ill.—2445 N. Keeler Avenue Cincinnati, Ohio—Spring Grove and Elmira Avenue Cleveland, Ohio—935 E. 63rd Street
Indianapolis, Ind.—57 S. Bolton Avenue New York, N. Y.—55 W. 42nd Street Philadelphia, Pa.—121 N. Broad Street
Pittsburgh, Pa.—1509 Arrott Building Richmond, Va.—3032 Norfolk Street Washington, D. C.—2205 Fifth Street, N. E.

The Philadelphia Warehouse of the Atlantic & Pacific Tea Company— heated by Heggie-Simplex equipment

Choice of Careful Corporations—

WHERE heating must be even, sure and economical—in the office buildings, warehouses and plants of leading corporations all over the country—you find Heggie-Simplex electric-welded steel heating boilers in steadily increasing numbers. The most modern of heating equipment—making certain the most satisfactory service at the lowest final cost.

Heggie-Simplex Boiler Co., Joliet, Illinois. Representatives in principal cities —telephone and address listed under "Heggie-Simplex Boiler Company."

HEGGIE-SIMPLEX

ELECTRIC-WELDED STEEL HEATING BOILERS

It is practically certain that, regardless of whom you have figured with on your heating, a Skinner Engineer can show you how to make a big saving—

One firm had $85,000 as the lowest figure on a heating installation—Skinner Engineers came in and saved them $35,000

It works out that way in 9 out of 10 instances. The man who is looking for a real heating installation gets figures from several sources. Then a Skinner Engineer looks over the layout—estimates are made and checked at the Skinner plant. In nearly every instance there's at least a 20% saving, not only in first cost but in operation.

How can they do it? They don't skimp on materials. Examination will show that the greatest care is taken in the design and construction of Skinner installations. They don't deliberately cut prices. No one can last long and do that.

Here's the answer—Skinner Engineers *know* industrial heating more thoroughly than any other engineers in America because they have a 34-year accumulation of heating experiences behind them. They are originators of the unit-heater method of warming the "work-area". For 34 years they have literally "lived" heating. In that time they have learned how to make every short cut to economy yet give you even and adequate distribution of heat where it is needed.

The heating knowledge of Skinner Engineers is so "sure-fire" that on practically every occasion, whether they have been called in first or have followed others, they have been able to show a mighty substantial saving. Primarily Skinner men are not salesmen but engineers, with a background that only such a world of experience can give.

Is it any wonder that Skinner Engineers are able to give you *better heating at less cost?*

If you have any doubt that Skinner Engineers can do this, just call them in. After they give you the Skinner estimate, chances are you will do what one executive recently did—he tore up all the other plans.

Main Office:
1450-90 S. Vandeventer
St. Louis, Mo.

New York Office:
1710 Flatiron Bldg.

See phone book for branches in:

Baltimore	**Indianapolis**
Boston	**Kansas City**
Buffalo	**Philadelphia**
Chicago	**Pittsburgh**
Cleveland	**Seattle**
Detroit	**Washington**

Factories at St. Louis and Elizabeth, N. J.

MAIL COUPON TODAY

Skinner Bros. Mfg. Co., Inc.,
1450-90 S. Vandeventer
St. Louis, Mo.

I am interested in:

- ☐ Heaters
- ☐ Ventilators
- ☐ Dryers
- ☐ Dust Collectors
- ☐ Light Weight Heaters
- ☐ Direct Fired Heaters

Name _____

Address _____

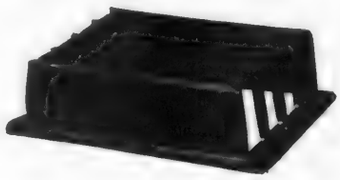
_____ H2

Skinner Brothers *Engineered* Heating

Originators of the Unit Method of "Work-Area" Heating

At this joyful season our thoughts revert gratefully to those whose courtesy, good will and loyalty have made possible our progress. We extend our heartiest wishes for your Happiness and Prosperity throughout the New Year.

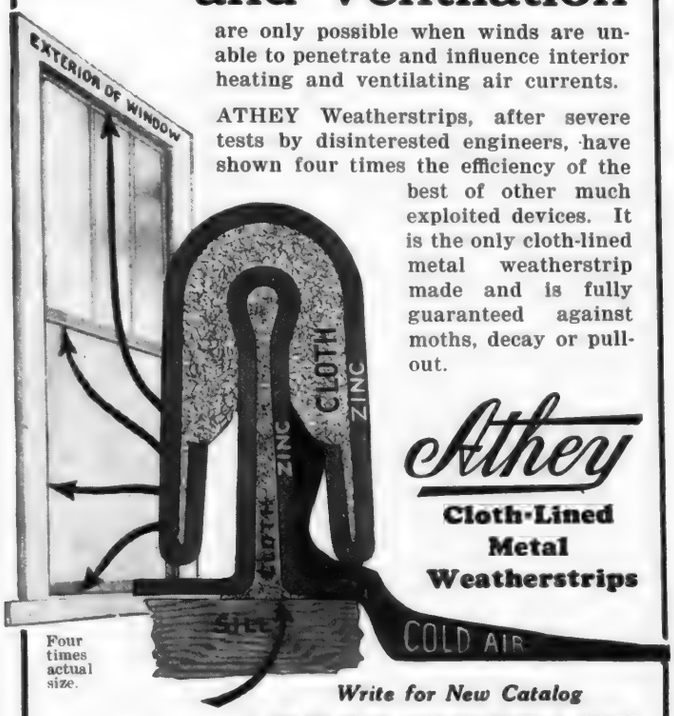
VENTILATING PRODUCTS CO.
CHICAGO, ILLINOIS



Controlled Heat and Ventilation

are only possible when winds are unable to penetrate and influence interior heating and ventilating air currents.

ATHEY Weatherstrips, after severe tests by disinterested engineers, have shown four times the efficiency of the best of other much exploited devices. It is the only cloth-lined metal weatherstrip made and is fully guaranteed against moths, decay or pull-out.



Four times actual size.

Athey

Cloth-Lined Metal Weatherstrips

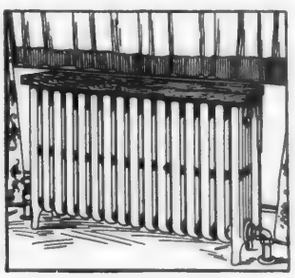
Write for New Catalog

ATHEY COMPANY
6007 W. 65th St. CHICAGO
New York City: F. H. Keese, 7 East 42nd St.
Detroit: W. O. LeSage & Co., 410 Donovan Bldg.
Cresswell-McIntosh, Reg'd—270 Seigneurs St., Montreal, Quebec.

The best Heating Engineers plan for sufficient heat with a minimum fuel consumption by Atheyising all windows of wood or steel.

Heating Contractors

Do Big Business by Installing our **Baked Enamel Shields** and **Art De Luxe Cabinets,** as every radiator installation means a ready and almost **Certain Prospect** for the **Sale** of our **Shields** or **Cabinets.**



We Want Dealers

That Means You

Architects

Continually specify and recommend our **Splendid Line** because **Circulation** is **Not Retarded** on **Account** of our **Construction** which permits of **Ready Circulation** of **Both Cold** and **Hot Air.**

Write for Prices and Dealer Agreement.

ACME RADIATOR SHIELD CO., Inc.
Manufacturers of "Modern" Radiator Furniture.
48 and 50 Vine Street, Cincinnati, Ohio.

These heaters cost less to install

BREEZO-FIN heaters cost *less* to install because they are shipped from Buffalo fully assembled, ready to hang from wall or ceiling. Just connect the steam lines and hook up the husky electric motor and you have heat immediately.

Give Higher efficiency

The BREEZO fan used on Buffalo heaters handles more air per kilowatt consumed than any other fan of equal size and speed on the market. That means that Breezo Fin heaters handle MORE air. They do it quietly and steadily, too.

Last longer

Breezo-Fins last longer because they're all steel; no cast-iron brackets to crystallize or break in handling. The motors are fully enclosed, with waste-packed bearings, the best type made for long, hard service.

These are only three reasons for the popularity of Breezo-Fin Heaters. Our catalog 466 tells the rest of the story. Are you interested?

Buffalo Forge Company

480 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower and Forge Co., Ltd., Kitchener, Ont.

"Buffalo" Breezo Fin Unit Heaters

Save Heat Dollars-

and Get More Heat!

This external view shows some Pecco Unit Heater features. Note that the cold air intake fan is located where it belongs —near the floor at the cold air level.

OBSOLETE heating methods have no place in a modern factory. They are wasteful of fuel, health, comfort and production. With Pecco Unit Heaters on the job your employes can start work when the morning whistle blows—comfortable, cheerful and alert, even though the thermometer has slumped to minus zero.

Science has at last solved the task of heating big spaces quickly and uniformly by fanning the warm air across the space at just the right distance from the floor.

It sounds logical, doesn't it? It is. Pecco Unit Heaters will put the heat anywhere you want it. They cost little to install and less to operate. In fact they'll soon save you fuel enough to pay their cost. There's a little book telling about Pecco Unit Heaters which we'd like to mail you if you will send us your address.

PECCO, *Incorporated*
2980 NORTH MARKET STREET
ST. LOUIS, U. S. A.

Heat With Unit Heaters!

Write for Free Book "Pecco Unit Heaters"

FOR USE IN

Woodworking Plants
Garages
Machine Shops & Metal Working Plants
Laundries
Drying Plants
Shoe Factories
Foundries & Forging Plants
Apartment House Garages
Theatres & Gymnasiums
Paper Mills
Warehouses
Soap Factories
Printing Plants
Painting Shops
Stone Yards
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Dairies
Bleacheries & Dye Works

A NEW AND BIGGER FAN

EMERSON 36-INCH EXHAUST FANS

2760

Write to any office of the company for printed matter on the complete line of Emerson Exhaust Fans.

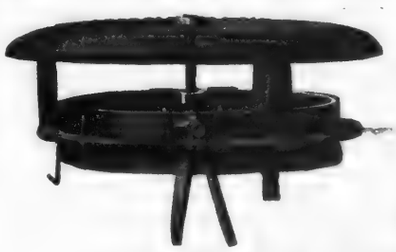
Big, powerful exhausters moving 10,000 cubic feet of air per minute, 600,000 feet per hour.

Large enough for the biggest halls, theatres and industrial plants.
Furnished for 3-phase and direct current.

Fully enclosed motors
Die-formed balanced blades
Wool-packed oil wells
Supporting ring of cold rolled steel plate
Cool running, quiet motors—Temperature rise less than 40° C

THE EMERSON ELECTRIC MFG. CO.
2018 Washington Ave., St. Louis, Mo.
806 W. Washington Blvd. Chicago, Ill.
50 Church St. New York City

BUILT TO LAST
EMERSON
MOTORS *and* **FANS**
SPLIT-PHASE POLYPHASE DIRECT CURRENT
REPULSION START INDUCTION



E-Z DAMPER GRIP-TITE Floor Vents

POSITIVE AIR CONTROL AT FLOOR LEVEL

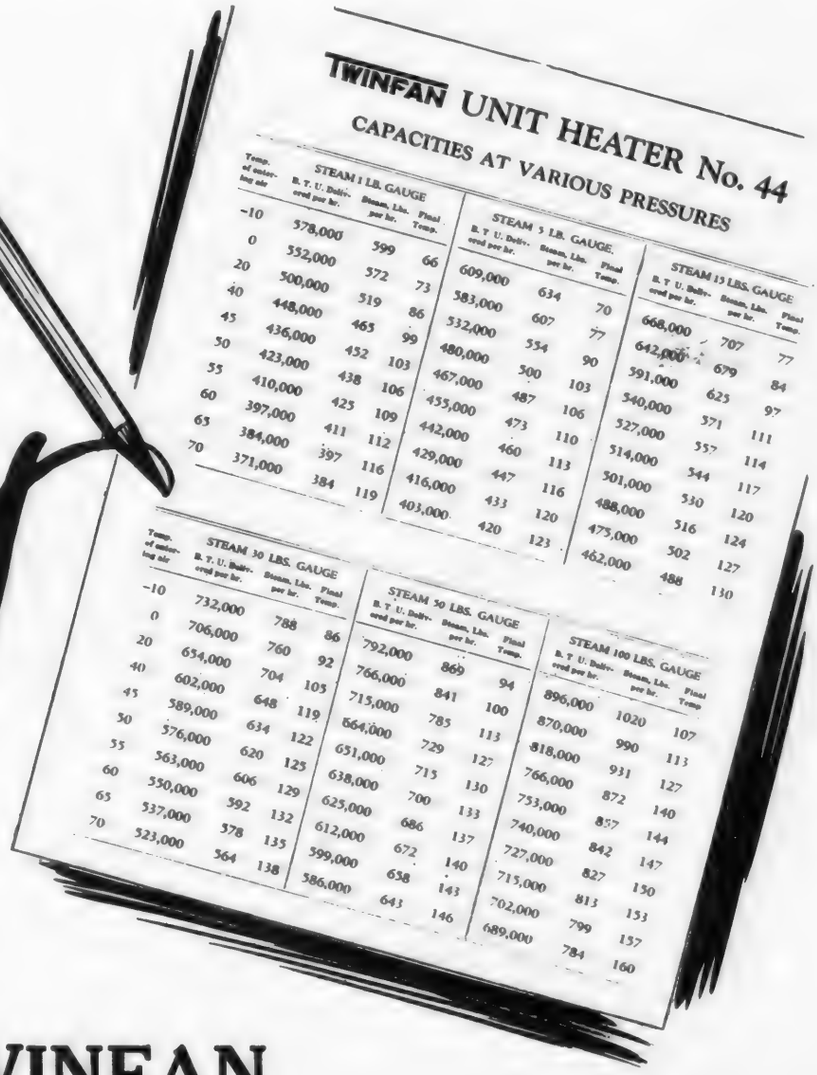
ÆOLUS DICKINSON
3336-44 So. Artesian Ave. CHICAGO
(Some territory open for agents)

CONTROL THE SPEED OF YOUR VENTILATING EQUIPMENT!
REGULATE WARM AND COLD AIR VOLUME
WITH THE TIME TESTED
HORTON VARIABLE SPEED PULLEY

HORTON MANUFACTURING COMPANY
3008-3016 University Avenue S.E. Minneapolis, Minn.
MINNEAPOLIS REFERENCES
Gerrish Co. Richardson-Boynton Co. Cook Co.
St. Paul

Above is shown a Twinfan Unit Heater suspended from a brick wall. It rests on an angle and the top corners are supported by strap hangers.

Easy to Figure



TWINFAN UNIT HEATER No. 44

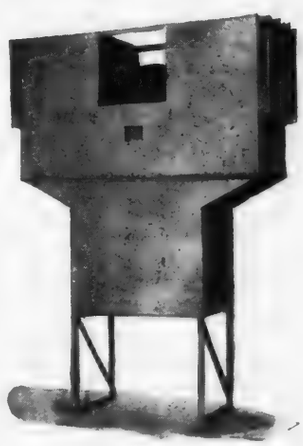
CAPACITIES AT VARIOUS PRESSURES

Temp. of entering air	STEAM 1 LB. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 5 LB. GAUGE. B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 15 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.
−10	578,000	599	66	609,000	634	70	668,000	707	77
0	552,000	572	73	583,000	607	77	642,000	679	84
20	500,000	519	86	532,000	554	90	591,000	625	97
40	448,000	465	99	480,000	500	103	540,000	571	111
45	436,000	452	103	467,000	487	106	527,000	557	114
50	423,000	438	106	455,000	473	110	514,000	544	117
55	410,000	425	109	442,000	460	113	501,000	530	120
60	397,000	411	112	429,000	447	116	488,000	516	124
65	384,000	397	116	416,000	433	120	475,000	502	127
70	371,000	384	119	403,000	420	123	462,000	488	130

Temp. of entering air	STEAM 30 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 50 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.	STEAM 100 LBS. GAUGE B. T. U. Delivered per hr.	Steam, Lbs. per hr.	Final Temp.
−10	732,000	788	86	792,000	869	94	896,000	1020	107
0	706,000	760	92	766,000	841	100	870,000	990	113
20	654,000	704	105	715,000	785	113	818,000	931	127
40	602,000	648	119	664,000	729	127	766,000	872	140
45	589,000	634	122	651,000	715	130	753,000	857	144
50	576,000	620	125	638,000	700	133	740,000	842	147
55	563,000	606	129	625,000	686	137	727,000	827	150
60	550,000	592	132	612,000	672	140	715,000	813	153
65	537,000	578	135	599,000	658	143	702,000	799	157
70	523,000	564	138	586,000	643	146	689,000	784	160

A Heating Installation with the

NEW TWINFAN CAPACITY TABLES

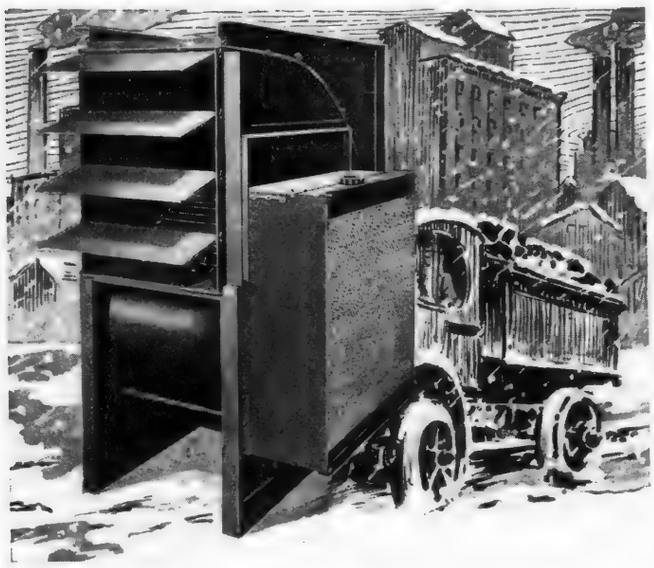


The heat unit output of the improved TWINFAN Unit Heater is a fixed and definite quantity; and we have made up capacity tables complete for steam from one to 100 lb. gauge, and for temperature of entering air from —10 deg. to 70 deg.

The capacities used on these Twinfan Unit Heater tables were determined by elaborate tests conducted in accordance with standards adopted by the Industrial Unit Heater Assns. and are fully guaranteed.

With these tables you can confidently lay out a heating installation, and install the necessary TWINFAN Unit Heaters, with the assurance that the building will be correctly and economically heated throughout.

These TWINFAN Heating Capacity Tables will be sent on request.



Block the first blasts!

—with directed heat

YOUR plant or building in Winter's zero grip will present one of these pictures:

Perhaps—

Lazy heat and lazy people. Dead radiation, idling heat units and lifeless air. Cool spots around windows and doors. Stuffy zones around radiators and coils. Ranks broken by illness.

Or Perhaps –

Moving vitalizing air and moving, energetic people. Heat units utilized. Good heat and good health.

You know that the difference between these pictures is the difference between direct heating and indirect, efficient, fuel-saving unit heaters.

In the opinion of hundreds of engineers the Johnson Unit Heater covers the established advantages of indirect heating in its highest development.

They are units in two types—the blower type as illustrated above, for heating and distributing air in high ceilinged rooms and long spaces; and the compact propeller type for application in low ceilinged rooms. Both types are made in variations to conform to special requirements and to simplify piping systems, thereby reducing installation costs.

One of our engineers will be glad to work with you in determining the advantages and economies of indirect heating by means of Johnson Unit Heaters.

Have you received your copy of the catalog?

Johnson Fan & Blower Co.
MANUFACTURERS OF FANS & BLOWERS FOR ALL PURPOSES
1323 W. Lake St., Chicago, Ill.
Offices—Principal Cities

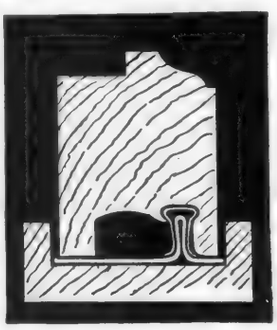
Johnson Unit Heaters

"Saved me 20% on my coal bill"

I had been using 12 tons of coal to heat my home. After having the doors and windows Higgin weatherstripped, I bought 10 tons for the winter of 1924-25, and had one and a half tons left. I figure that the weatherstrips saved me 20 per cent on my coal bill for my home.

—John R. Thorne, Olathe, Kan., in letter to a prospect for weatherstripping.

No claim of ours could be so strong as this statement from a Higgin user. Higgin Weatherstrips have a real dollars - and - cents value to your clients.



The illustration shows how the spring flanges of the exclusive Higgin INSERT grip the sides of the raised rib and close the space around the sash at every point. There is no air leakage where the sash is cut out for the cord, nor seepage around the rib when the sash shrinks. The metal-to-metal contact insures a perfect and permanent fit and closure; also an easy sliding sash under all conditions.

You can guarantee a definite heating efficiency for your equipment with an even temperature throughout the building when Higgin All-Metal Weatherstrips are installed. They keep the cold air out and the warm air in. Every job is installed by trained Higgin men and guaranteed by the Higgin organization.

The Higgin Manufacturing Company
Newport, Ky. **Toronto, Can.**
Manufacturers of Higgin All-Metal Weatherstrips and Higgin All-Metal Screens.

HIGGIN
ALL METAL
WEATHER STRIPS

HEAT WITH UNIT HEATERS

Five times as efficient as ordinary radiation. Delivers from 450 to 900 cubic feet of hot air per minute. Cheaper to buy, install and operate.

A new small Venturafin Unit (Size No. 2) for stores, offices, shops, garages, factories, showrooms, warehouses, depots, and countless other places.

Ventilates as it heats—gives positive heat control and more even distribution of heat in working areas — and is pleasing in appearance.

One-quarter the weight of an equivalent amount of radiators, wall coils, etc., and occupies only one-tenth the space.

Heats up in a jiffy in the morning. Reduces heat losses to a minimum. Forces heat where you want it, when you want it.

Send for free catalogues and descriptive folders

AMERICAN BLOWER COMPANY
BRANCH OFFICES IN PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, WINDSOR, ONTARIO

American Blower

"Sirocco" TRADE MARK
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

TENTACULAR DRIVING A BLOWER

PICTURE SHOWS TENTACULAR DRIVING A BLOWER AT THE NAZARETH CEMENT COMPANY, NAZARETH, PA.

This is what they say of Tentacular:

Nazareth, Pa., September 17, 1927.
Alexander Brothers, Philadelphia, Pa.

Gentlemen:

Referring to your request of August 20th I wish to advise that the Tentacular Belt we purchased from you in December, 1925, was put in service in January, 1926, and has been operating ever since, twenty-four hours a day. It is giving very good results, showing no slippage and being in a very good condition.

Yours very truly,

NAZARETH CEMENT COMPANY,
By W. Follweiler, Operating Supt.

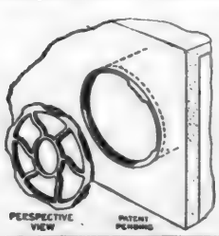
ALEXANDER BROTHERS, Inc.

14 SOUTH STREET Makers of Leather Belting Since 1867 **PHILADELPHIA, PA.**

Visit the Power Show and See Tentacular—Booth No. 625

for gallery risers USE Round shaped Vents

Oblong openings in the gallery risers weaken the structure, but round holes do not. That is why architects favor round shaped vents. Moreover, they are easier and cheaper to install.



Ask for Details About DISC-LOC

The only round vent for gallery risers. Used in many of the newest theatres. Made with or without dampers. Complete particulars sent on request.

KNOWLES MUSHROOM VENTILATOR CO.
202 Franklin St., New York

Seamless Copper and Brass Tubing---In Stock

Quick Shipment of Standard Sizes or Specials. Write for "In Stock" List.

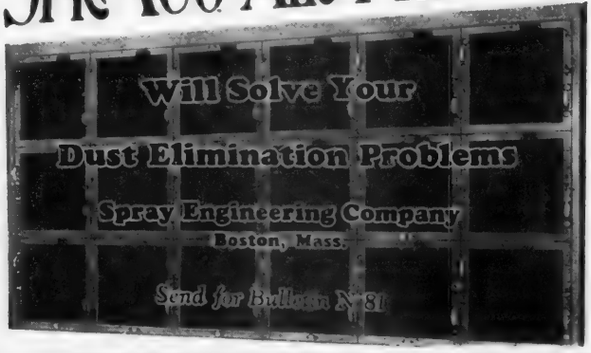
WOLVERINE TUBE COMPANY

1415 Central Avenue **Detroit, Michigan**

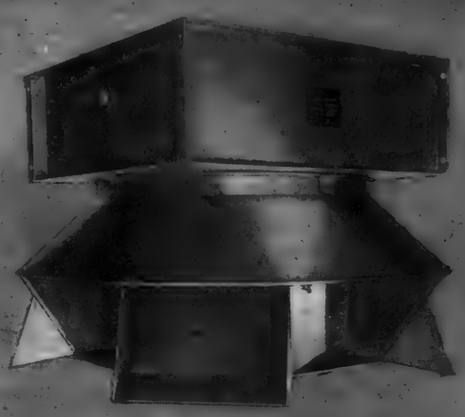
Chicago, Ill. 129 S. Jefferson St.
Cleveland, Ohio 602 Hunkin-Conkey Bldg.
Rochester, N. Y. 206 Central Trust Bldg.

WOLVERINE
SEAMLESS COPPER AND BRASS TUBING

SPRACO AIR FILTERS

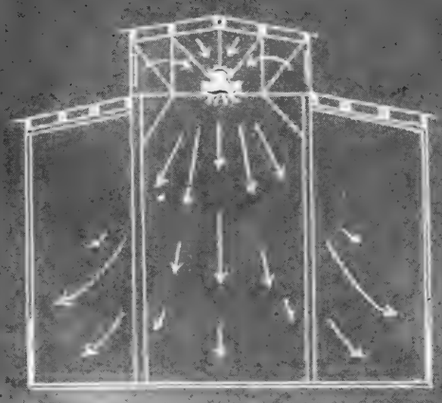


WING FEATHERWEIGHT UNIT HEATERS



Low Ceiling Type

High Ceiling Type



This diagram illustrates graphically the Wing principle of heating.

The air is taken from the top of the building where it is already somewhat warm and is forced through the Wing Heaters to the working level where it is gently circulated giving uniform distribution.

A Worker in Comfort is Worth *Two* Half-frozen!

LOTS of heating systems put *enough* heat into the building—but not in the right places!

If you investigate, you'll find the air under the roof warm—if not positively hot—while the workers at the floor shiver. When men are uncomfortable their work shows it—in quality and quantity.

There's no need for this uneconomic, unhealthful, uneven distribution of heat, because Wing Featherweight Unit Heaters deliver heat where it is wanted.

Heat with Unit Heaters

Installed overhead, they gather in air from the upper spaces, reheat it in their efficient copper-tube heating elements, and then project it downward to the working level, where it is diffused uniformly.

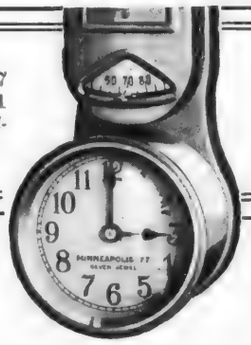
An investigation of the Wing Way of Heating will more than repay you. There's a coupon below for your convenience.

L. J. WING MFG. CO., Hudson and 13th Sts., New York

L. J. Wing Mfg. Co.
Please send me your Wing Heater Booklet.
*Name*_____
*Address*_____
*City*_____
*State*_____

WING *Featherweight* UNIT HEATERS

Minneapolis Model 77 8-day 7-jewel clock. A precision-built, dependable timepiece.



When Should Unit Heaters be Clock Controlled?

The purpose of clock control, a familiar feature on thousands of household installations of the Minneapolis Heat Regulator, is to effect a change in the established temperature level, automatically. This alarm clock principle operates both to raise the temperature in advance of using rooms or working spaces, and to shut down the heat at the end of the working period, automatically maintaining a lower level until heat is desired again.

Obviously, this type of control is desirable on unit heater installations where departments or sections of buildings are not used at night. Makes operation completely automatic. No supervision needed to see that heat is "on" in time. Lower temperature maintained at night — saves fuel. Never drops below a predetermined level—no danger through freezing. The Minneapolis clock may be set for changes at any hour—day or night—to fit the operating program.

Write for booklet describing Minneapolis low voltage controls for unit heaters—with or without the clock.

The "MINNEAPOLIS" HEAT REGULATOR

FOR UNIT HEATERS

Minneapolis-Honeywell Regulator Co.

Executive Offices: Minneapolis
Factories: Minneapolis and Wabash

Mail the coupon for booklet on Automatic control for unit heaters.

Minneapolis Honeywell Regulator Co.
2804 Fourth Ave., So., Minneapolis, Minn.

Send your booklet on automatic control for unit heaters. Explain clock control.

Name .....

Name of Firm .....

Address .....

City .....State .....

The American System of Temperature Indication

TYPE C

The Caliscope

is an electric device used for the remote indication of both wet and dry bulb temperatures, and without further use of charts or calculation, shows the comfort zones or the correct relation between the temperature and the moisture content of the air for the comfort of the occupants.

It centralizes your control and supplies the intelligence to properly operate the heating, ventilating and refrigerating systems.

ACCURATE *and* DEPENDABLE

OUR "NEW" SINGLE UNIT

CALISCOPE

TYPE A

The Type A Caliscope is especially adapted for indicating temperatures where only a few elements are required in theatres, offices, public buildings, apartments, factories, cold storage plants and greenhouses.

This instrument is simple to install and guaranteed permanent in calibration.

Furnished complete with Thermoscope (dry bulb room element) including wire up to 300 feet.

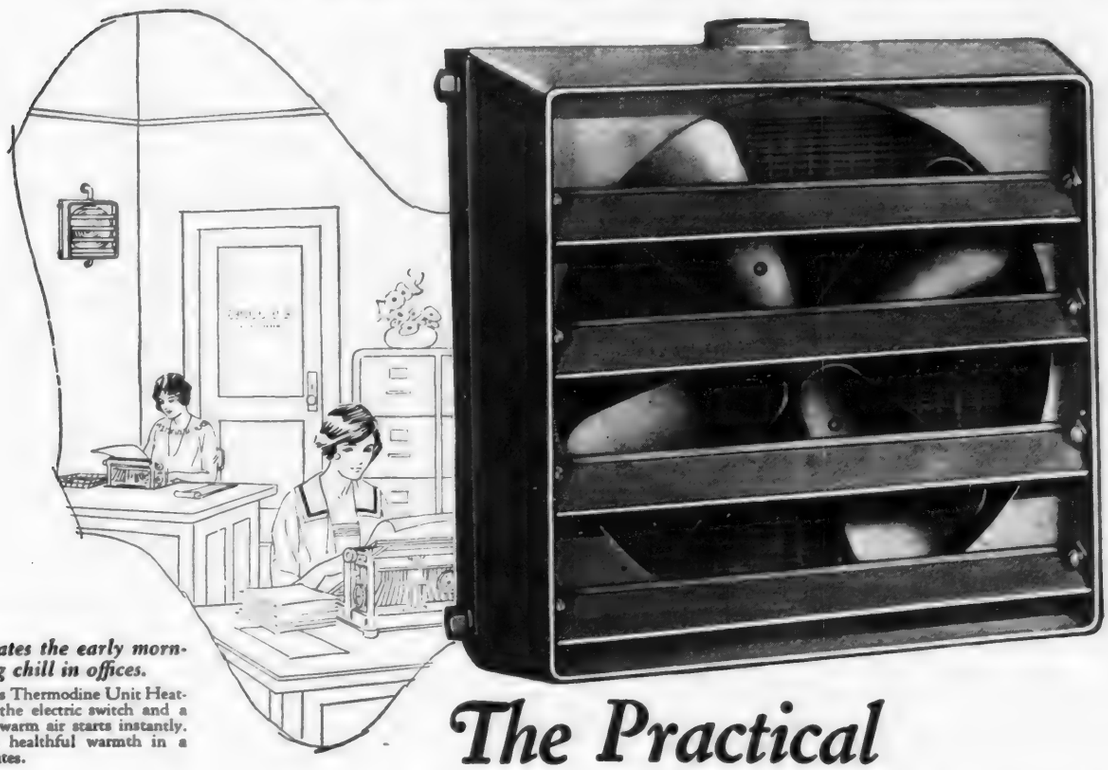
Price $65.00

The American Temperature Indicating Co.

1017 Summit Street TOLEDO, OHIO

THERMODINE UTILITY HEATER

The Quick, Quiet, Efficient Heater for Offices, Salesrooms, Stores, Homes



Eliminates the early morning chill in offices.

With this Thermodine Unit Heater, turn the electric switch and a flood of warm air starts instantly. Pleasant, healthful warmth in a few minutes.

The Practical Unit Heater for Small Space Heating

HERE is the first practical Unit Heater for small space heating—the Thermodine Utility Heater. Only 12″ wide, 12″ high, 9½″ deep, 40 pounds in weight, sturdy, attractive in appearance, the Utility Heater is adaptable to offices, stores, salesrooms, restaurants — any small space.

The Thermodine Utility Heater possesses extraordinary heating capacity—replaces 100 sq. ft. of cast iron radiation—supplies heat instantly—suspends from the steam line, up out of the way—is ideal where cast iron radiation has proved insufficient. Its quietness of operation makes it practical for homes — recreation rooms, kitchens, billiard rooms, basements. In the basement, it suspends from supply main above water line of boiler, eliminating need of pumps for returning water to the boiler.

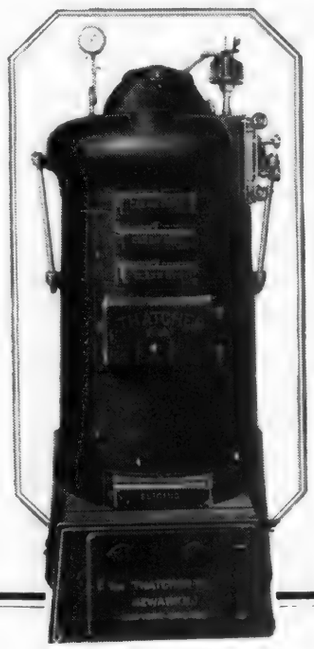
The Thermodine Utility Heater is easily installed in a few minutes after piping has been completed. Adjustable deflectors give vertical control of heated air—put heat where it's needed. *Write today for new Catalog, No. 227, containing complete facts about the Utility Heater.*

MODINE MANUFACTURING CO., (*Heating Division*), 1707 Racine Street, Racine, Wis.
BRANCH OFFICES IN ALL LARGE CITIES

THERMODINE
UNIT HEATER
FOR STEAM OR HOT WATER HEATING SYSTEMS

ThermoDine

THATCHER
ROUND BOILER



Its many unusual advantages make strong selling points

BUILD your sales around the many unusual advantages of the Thatcher Round Boiler. It gives you real selling points backed by actual worth.

A few of these advantages are the "staggered fire travel" which utilizes all hot gases and smoke before entering the flue; the sensitive drafts, checks and dampers which respond instantly and automatically; the depth and large coal carrying capacity of the fire pot which makes firing periods less frequent.

Write for the complete story about the profit-making Thatcher dealer proposition.

The Thatcher Company
Since 1850

NEWARK, N. J.—39-41 St. Francis St.
NEW YORK—21 W. 44th St.
CHICAGO—341 N. Clark St.

Buy Christmas Seals
Fight Tuberculosis

THATCHER
BOILERS-FURNACES-RANGES

The Frost Research Laboratory

A nationally recognized Research Service for the Heating and Ventilating Industry.

An unbiased Laboratory for performance testing and compilation of engineering data on

Boilers
Radiators
Unit Heaters
Blast Heaters
Oil Burners
Gas Heaters
Electric Heaters
Radiator Valves and Traps
Fans, etc.

The laboratory is entirely independent in its financial connections and is under no obligation to any manufacturing interests.

The service is available to all manufacturers of heating apparatus and provides a confidential source of information that has been utilized by fifteen different manufacturers within the last two years.

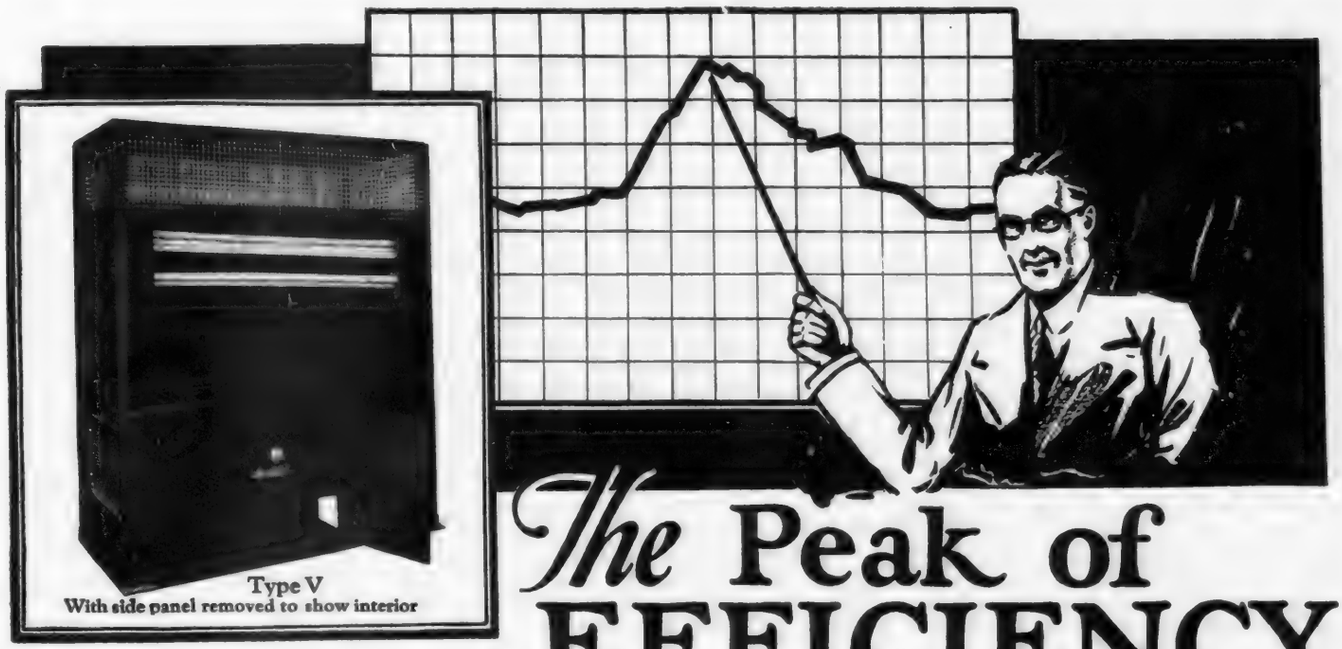
Contracts for service are made on the basis of charge

Per day
Per test
Per series of tests
or
Per month for a varied service within certain stipulated limits.

The "TEST LOG," issued every two or three months, with information of interest concerning the laboratory and valuable engineering data, is available to manufacturers and others interested in research. Do you receive your copy? If not, ask that your name be placed on our mailing list.

THE FROST RESEARCH LABORATORY, Inc.

48 Curren Arcade **Norristown, Pa.**



Type V
With side panel removed to show interior

The Peak of EFFICIENCY

is obtained with Massachusetts Unit Heaters

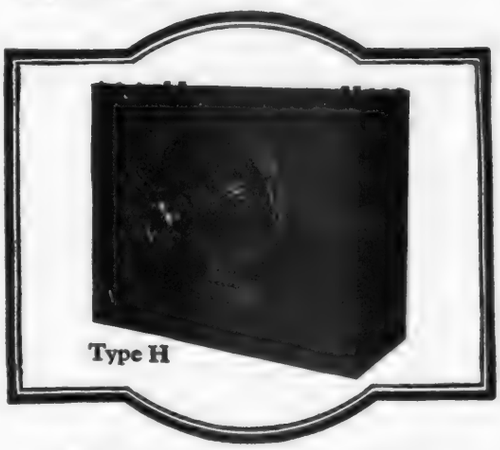
The Arcoblast heating element composed of staggered rows of metallicly attached fin-wound copper tubes expanded into two castiron tube sheets which, with the tapered design cast-iron header bodies flange-connected to the tube sheets, form the supply and return headers.

EACH Heater is self contained—consisting of Fan, Motor, Heater Coil completely encased. Heat supply for each section of the building can be controlled at will. The heating up period, in the morning, is reduced to a fraction of that required with a direct radiation system.

Massachusetts Unit Heaters are shipped assembled ready for operation. Type V Units are internally wired, Starting Boxes being mounted on the Unit. When in position, only steam and external electrical connections are necessary.

The Type V Unit, drawing cool air from a point just above the floor level, and discharging horizontally at high velocity just above the breathing or working zone, distributes the heated air in the breathing zone. The air inlet of Type V Unit Heaters, being just above the floor line, removes the lower strata of cool air, allowing the warmer strata in the breathing zone to fall, thus insuring a uniform temperature.

The design of the Unit Heater, is such as to enhance the appearance of its surroundings, replacing unsightly units with an efficient, mechanically correct means of heating. Ornamental grilles of pleasing appearance replace the usual cowls, elbows and baffles.



Type H

Where floor space is not available we recommend the Ceiling Type H Unit Heater, built in three sizes, 18", 24" and 30" deflector plates and re-circulating boxes can be furnished if required.

MASSACHUSETTS BLOWER DIVISION *of*
THE BISHOP & BABCOCK SALES CO.
General Offices: 4901-4915 Hamilton Ave., N. E.
Cleveland, Ohio

BISHOP & BABCOCK

TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

Burnham Boilers

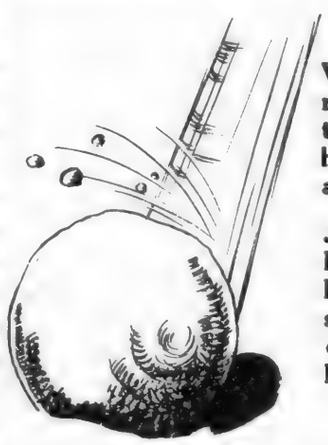
Pack That Burnham Snowball And Set It Rolling

FOR very definite reasons, every Burnham you sell begins at once to roll up new business for you.

One reason is its extra long fire travel, that makes the short coal bill. You know how that is.

In our experience every one likes to save on the cost of fuel, and will boast about what they save.
That's human nature.

Well then, every customer to whom you sell a Burnham, goes to rolling your business snow ball.



We're just remarking something we've seen happen again and again.

Just look in Catalog 67 and see how many other snow balls you can start with Burnhams.

Burnham Boiler Corporation
IRVINGTON, N. Y.

Representatives in all Principal Cities of the United States and Canada.

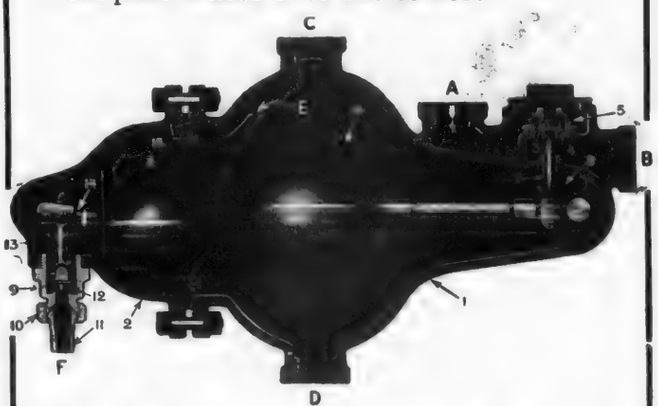
Whose Fault when the boiler BURSTS?

Is it fair to blame it onto the owner who believed he was buying a good heating plant? Or the boiler manufacturer who provided a serviceable boiler that should last year in and year out?

Regardless of whose fault it is, the boiler burst—when it could have been positively protected by the McAlear Water Feeder.

McAlear automatic water feeders give dependable protection to Coal, Gas and Oil-fired boilers.

McAlear Water Feeders for oil burners will positively supply automatically the necessary make-up water to the boiler, and discharge all surplus water into the sewer.



The McAlear will cut out the oil burner at the low water danger point, and cut out the oil burner at any steam pressure point desired!

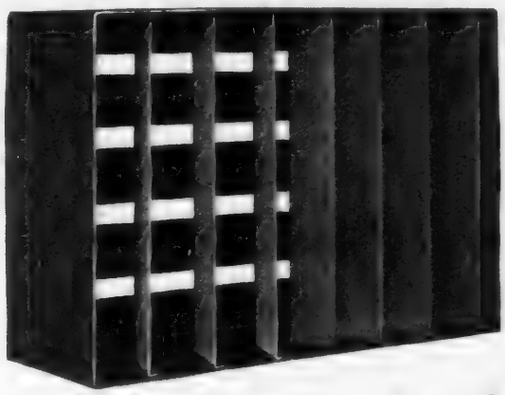
Complete details regarding the McAlear Direct-to-Boiler Water Feeders, including blue print showing application and roughing-in dimensions, are furnished in our Bulletin K.

Write for your copy of this bulletin today.

McALEAR
MANUFACTURING COMPANY
19th and Western
CHICAGO, ILLINOIS

Lakeside
Ventilating Systems
Quiet~Efficient

A Size to Meet Every Need



Equipped with Adjustable Air Deflector

A Constant Supply of Fresh, Pure Air

The Lakeside System does not exhaust—but propels the air. It changes all the air in the room every few minutes. It floods the entire room with a powerful current of fresh, pure, outside air, which is surcharged with life-giving oxygen. This powerful current of pure air from outdoors, expels the foul, devitalized air, entirely from the room. Pure air is nature's great restorer, and insures better health, more comfort and keener enjoyment of life.

Special Lakeside Features:

All-Steel Construction.
Patented Tex-rope Drive.
Interchangeable Parts.
Quiet Operation.
Curved impeller blades.
Improved Control Board.
Standardized Construction.
Greater air capacity.
Adjustable volume control.
Direct or remote control.
Compact in size.
Self-aligning SKF Ball Bearings.
Specially designed outlet silencer.
Grooved speed control, steel pulleys.
Specially designed, low-speed motor.
Capacity 3,000 to 25,000 cu. ft. per minute.
Interchangeable outlet, at top or bottom.
All-Steel, Adjustable Four-Way Deflector.
Precision machined, cold rolled steel shafting.
Self-oiling. Needs attention only twice a year.
Easily dis-assembled into three convenient parts.
Close center installation, requires but little space.

Basement, main floor, elevated or ceiling installations.

A Necessity for—

Restaurants—Clubs
Hotels—Bakeries
Schools—Churches—Y. M. C. A.'s
Theatres—Dance Halls
Factories—Mills—Foundries
Billiard Halls
Bowling Alleys—Elks Clubs
Stores—Cleaners & Dyers
Hospitals—Laundries
Garages—Repair Shops
Printers—Photo-Engravers
Display Rooms—Smoking Rooms
Newspapers—Magazines

Write For CIRCULARS, PLAN SERVICE and ESTIMATES

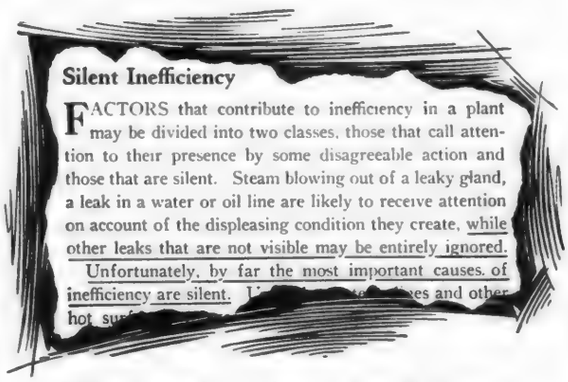
Our Service Department will gladly suggest practical installations and give you complete detailed information with estimate of cost upon request. Architects, Builders and Contractors are invited to avail themselves of this special service of our experienced ventilating engineers.

SALES ENGINEERS—Write For Our Sales Plan

Our Liberal Proposition to reliable Sales Organizations will interest you, if we have no Sales Agency in your city. Write for details.

THE LAKESIDE COMPANY Dept. 102 Main St., Hermansville, Michigan

The underlines are ours—



Silent Inefficiency

FACTORS that contribute to inefficiency in a plant may be divided into two classes, those that call attention to their presence by some disagreeable action and those that are silent. Steam blowing out of a leaky gland, a leak in a water or oil line are likely to receive attention on account of the displeasing condition they create, while other leaks that are not visible may be entirely ignored.

Unfortunately, by far the most important causes of inefficiency are silent. [illegible] and other hot surfaces

Editorial from Oct. 11th, 1927 issue of "POWER".

Mason Regulators put an effective stop to one of the worst forms of "silent inefficiency."

They are designed, built and tested to meet the most exacting conditions of service and their accuracy does not diminish with long continued use.

Write for a copy of Catalog No. 62 giving a complete description and prices of Mason Regulators for every power and process service.

Mason Regulators

MASON REGULATOR CO.
BOSTON, MASS.

1445

Many an Oil Burner Has Been Condemned

On account of an inefficient boiler, but now you can have the comforts of Oil burning on an economical basis.

BRYAN BOILERS

Cut Your Oil Bill 30 to 50%

The progressive heating contractor wants the new modern appliances to keep up his volume of business.

Oil burners are a success, the field is large and this is

"Truly a wonderful boiler."

Get Your 1928 Franchise

STEAM—VAPOR—WATER

Sold only through the heating trade on exclusive local sales franchise basis

Manufactured by

BRYAN STEAM CORPORATION
(Boiler Division)
PERU, INDIANA, U. S. A.

Correct Ventilation for 1-2-3-Story Buildings

with the

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

Power Roof Ventilator

FOR one story stores, factories, theatres, and for lodge rooms and dance halls which are located on the top floor, the ILG Power Roof Ventilator affords a most efficient and economical method of correct ventilation.

Power driven, and controlled by a turn of the switch, the ILG Power Roof Ventilator insures positive, ventilation, without objectionable drafts, in any kind of weather, winter or summer.

Tests prove that size for size one ILG Power Roof Ventilator is equal to three ordinary gravity or natural ventilators—whether it's a problem of ventilation or one of exhausting steam, gases, fumes, etc.

Buildings with hung ceilings can be as efficiently ventilated with the ILG Power Roof Ventilator as those of single roof construction; it is also recommended for ventilating certain types of two and three story structures where a straight air shaft can be used.

The ILG Power Roof Ventilator is the only one made with a fully enclosed self-cooled motor, installed in a heavy duty pent house, equipped with an ILG Aluminum Automatic Shutter. Made in sizes from 12 to 72 inches and manufactured, tested, sold and guaranteed as a complete unit.

Ilg Electric Ventilating Co.
2858 No Crawford Avenue
Chicago, Illinois

A new bulletin featuring the ILG Power Roof Ventilator is now ready. It contains complete data and many interesting facts and figures. Send for a copy — clip, sign and mail the coupon today!

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY Ventilation

for Offices, Stores, Restaurants, Factories, Public Buildings, Homes, Theatres, etc.

COUPON

Without obligation please send a copy of your new Pictorial Bulletin which completely describes, illustrates and lists ILG Power Roof Ventilators.

Name _____

Full Address _____

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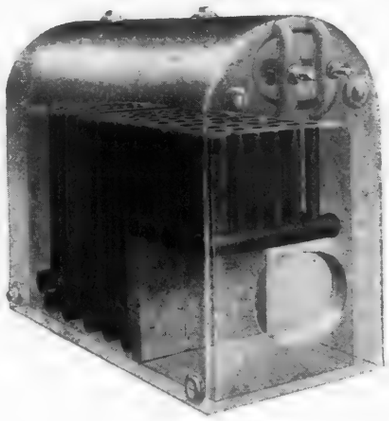
JOHNSTON

Electric Welded Steel Heating Boiler



OIL BURNER TYPE

BECAUSE an owner buys a boiler only once, a little higher first cost is not so important.

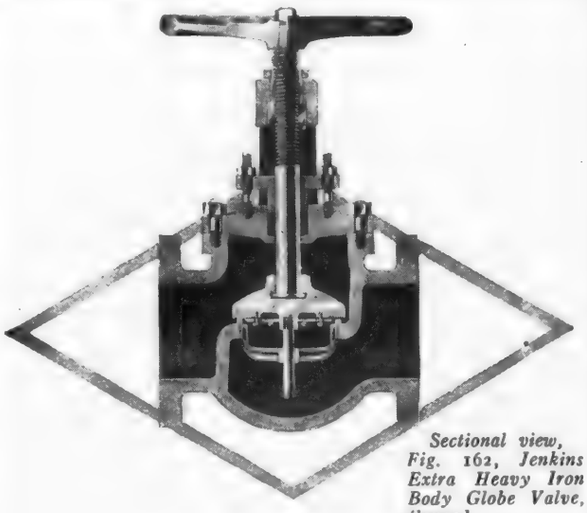
BUT buying oil year after year makes fuel saving immensely important.

THEREFORE, in specifying a new boiler for oil burner service, should you not consider these points?

1. **Designed and built expressly for oil fuel.**
2. **Adapted to any type of domestic oil burner.**
3. **Of proven high efficiency to insure minimum cost of fuel.**
4. **Thousands of oil-fired installations, using converted coal-burning boilers are giving "fairly good results."**
5. **Your client is entitled to and will willingly pay for results, better than "fairly good."**

Johnston Brothers, Inc.

FERRYSBURG, MICHIGAN



Sectional view, Fig. 162, Jenkins Extra Heavy Iron Body Globe Valve, flanged.

When jobs call for iron body valves

Fig. 142
Flanged Jenkins Standard Iron Body Globe Valve

When jobs call for iron body valves, you can stand squarely in back of valves marked with the Jenkins "Diamond." For Jenkins Iron Body Valves fully measure up to Jenkins standards; they are given the same wide margin tests at the factory; they are guaranteed in every respect.

Note, in the sectional view, the thorough even distribution of metal. There is no weakness at any point, and in every detail the manufacture is a work of precision and care. Machining is held to close limits; assembly is painstaking; inspection is minute during every step.

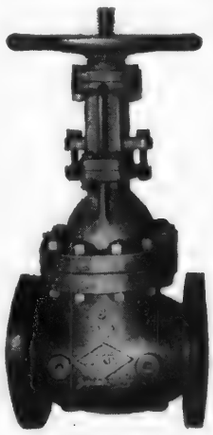


Fig. 204
Flanged, Jenkins Extra Heavy Iron Body Gate Valve

Jenkins Iron Body Valves are made in standard, medium and extra heavy pattern, in globe, angle, cross, check, Y, gate and other types, screwed or flanged. Experience of over half a century and an intimate knowledge of valves and valve requirements dictate the design and construction of these valves, and you can rely on them for any job calling for an iron body valve.

JENKINS BROS.

80 White Street.....New York, N. Y.

524 Atlantic Avenue...Boston, Mass.
133 No. Seventh St..Philadelphia, Pa.
646 Washington Blvd....Chicago, Ill.

Jenkins Bros., Limited
Montreal, Canada London, England

Always marked with the "Diamond"

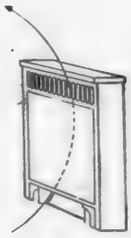
Jenkins Valves

SINCE 1864

New!

Six Distinct Advantages in *This* New Convection Heater!

Installed in wall. No floor space required.



Also in attractive cabinets replacing unsightly cast iron radiators.

6

[1] *Oval Tube* insures even distribution of heat over entire plate area and permits free circulation of air.

[2] *Removable Panel* permits immediate access to heater and piping.

[3] *Cold-Air Deflector* increases over-all efficiency seven per cent.

[4] *Self-Contained Unit* (consisting of heater, deflector and damper), mounted in heavy casing, prevents damage in handling and simplifies installation.

[5] *Air-Tight Damper* on heater itself prevents leakage, cutting off heat entirely when closed.

[6] *Air-Dome Return*—of heavy cast bronze—allows use of siphon air valve with its consequent fuel economy and trouble-free operation.

The Circulair Heat Unit, designed by Willis H. Carrier, national authority on heating and ventilating, represents the most advanced step in modern heating. With many improvements that are revolutionary, Circulair provides the practical combination of added economy, increased efficiency and architectural charm. *Send for catalog and complete data.* CIRCULAIR HEAT, Incorporated, 215 Central Ave., Louisville, Ky.

Circulair HEAT

Use This

CIRCULAIR HEAT, Incorporated, 215 Central Ave., Louisville, Ky.

Send, without obligating me, catalog and complete data on Circulair Heat Units.

Name .....

Address .....

City ..... State .....

PROTECTION *for YOU and your customer!*

Promote your business reputation and your profits

USE VINCO TO CLEANSE NEW JOBS

As the finishing touch to put a well engineered new or remodeled heating system into first-class operating condition before turning it over to the owner, VINCO treatment is the Engineer's and Contractor's best protection against unnecessary conferences, arguments, "buck passing," bad temper and withheld final payments.

A heating system cleansed with VINCO is conspicuous for its free steaming, steady water level, easy circulation and care-free boiler attendance from the start and afterwards for the efficient absorption of all usable furnace heat.

Use Vinco to Restore Old Heating Systems to Original Efficiency

Our Vinco Kit-Kan will bring you good profits and new customers

This economical 1½ lb. can will cleanse the old steam, vapor or hot water system of the usual 6 to 8 room house.

Your customers will all be grateful for the cozy warmth, low fuel bills with less bother.

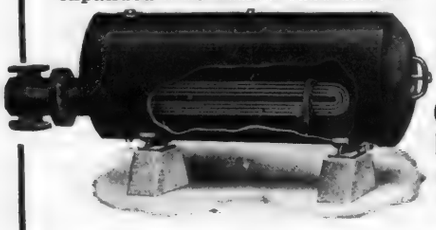
Send them our letters about Vinco. We'll mail you as many as you need.

VINCO at The Power Show
Three fascinating glass heating systems that answer the "why" of many heating problems. You'll enjoy playing with them!
Visit us at Booths 217-218

THE VINCO COMPANY, INC.
75 Vesey Street, New York, N. Y.

O.E.F. Storage Heaters give Dependable Service

These heaters are made in the U-tube and straight tube types; steel of flange quality used throughout. The heavy gauge seamless drawn copper tubes are expanded into rolled tube sheets.



Tanks and parts for all sizes carried in stock. Write us for further details.

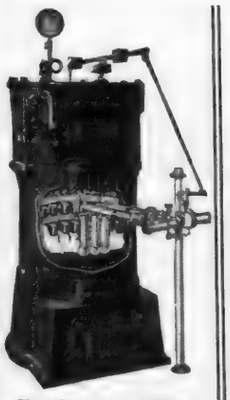
O. E. FRANK HEATER & ENGINEERING CO., Inc
Factory and Offices at Buffalo, N. Y.

On which do you want information?

Regulating Valves for Heating and Ventilating

- ☐ REDUCING VALVES
- ☐ DAMPER REGULATORS
- ☐ TEMPERATURE REGULATORS
- ☐ PUMP GOVERNORS
- ☐ FLOAT VALVES
- ☐ SWING JOINT FITTINGS
- ☐ THERMOSTATS
- ☐ BALANCED VALVES

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.



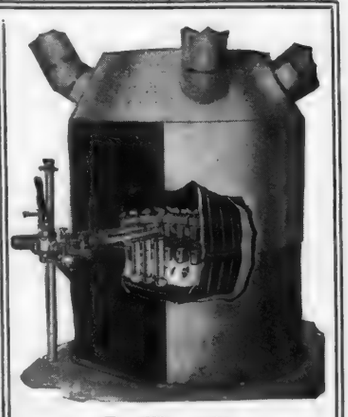
For Steam or Water

An Ideal Method of Burning Gas

The Franklin (1927 Improved) Gas Burner has made possible the economical use of gas in the same boiler, furnace or heater that you are now using for coal. Think of the convenience and comfort of changing your present coal furnace to a gas heating plant with the Franklin at a very low cost. Burns natural or artificial gas or their combination. Only a few minutes required for change from one fuel to another. No adjustments necessary. Safe. Reduces fuel consumption. Many users depend upon the Franklin for all-year heating.

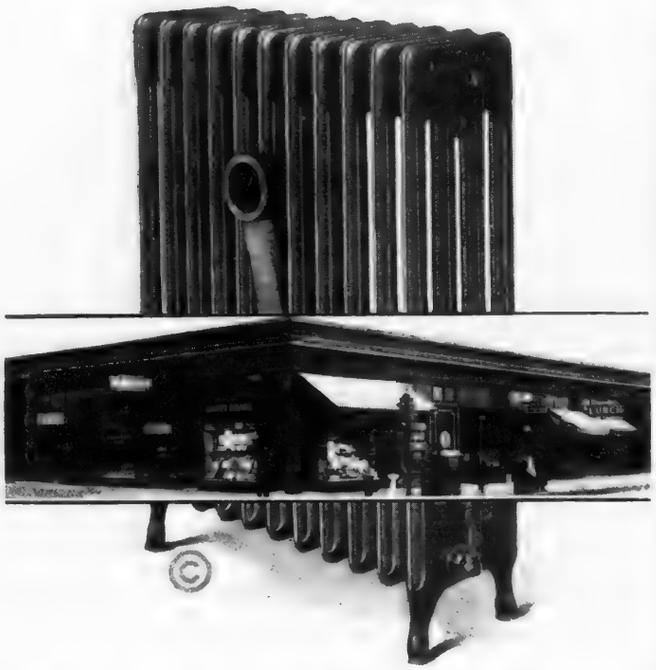
Write for New Catalog—Prices—Circulars

FRANKLIN GAS BURNER APPLIANCE CO.
221-23 E. 8th Street **Cincinnati, Ohio**



For Warm Air

HEAT WITH UNIT HEATERS
Investigate!
Sooner or later you will probably have occasion to install Unit Heaters in a factory, garage, or other industrial building. Study the following features of this modern system and send for the Peerless Unit Heater Catalogue.
Lower first cost, as compared with ordinary steam radiators; less piping, fewer valves and fittings, less time and labor to install. Quicker heating—working zone heated first, not the space near the roof. Perfect control of temperature; heat can be shut off quickly by stopping the motors; less opening of windows. Complete circulation of air throughout the room, without drafts. Mechanical ventilation easily provided for, if desirable. Uniform heating, even in hard-to-heat corners. Enormous savings of weight and floor space. Also large savings of steam in moderate weather and when rooms are unoccupied. Automatic control, if desired. Easily installed in old buildings as well as new. Simple construction, dependable operation. Suspended or floor-type units, as required, and competent engineering service.
Write for the Peerless Catalogue now while you have it in mind.
Peerless Unit Ventilation Co., Inc.
718-34 Crescent Avenue,
Bridgeport, Connecticut.
Offices in Principal Cities
PEERLESS
UNIT HEATER



One of the thousands of buildings heated by Clow Gasteam Radiators

This block of 7 stores, at 53rd and Lake Park Avenue, Chicago, Illinois, is heated entirely by Clow Gasteam.

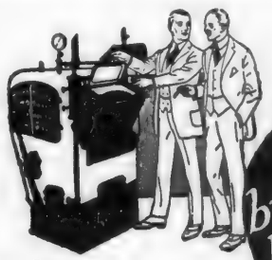
These stores are independent of any other heating system, and one store can be heated independent of the others. With Clow Gasteam, no basement is necessary.

Are you getting your share of this business? This is one of the thousands of such installations spread throughout the entire country. Clow Gasteam Radiators are easy to install —labor is small—selling is easy— and profits on the merchandise are worth considerable thought.

Our catalogue shows how Clow Gasteam is heating all types of buildings, in all sections of the country.

JAMES B. CLOW & SONS
201-299 North Talman Avenue, Chicago.

CLOW GASTEAM



NO FORCED DRAFT

burns No. 1 Buckwheat

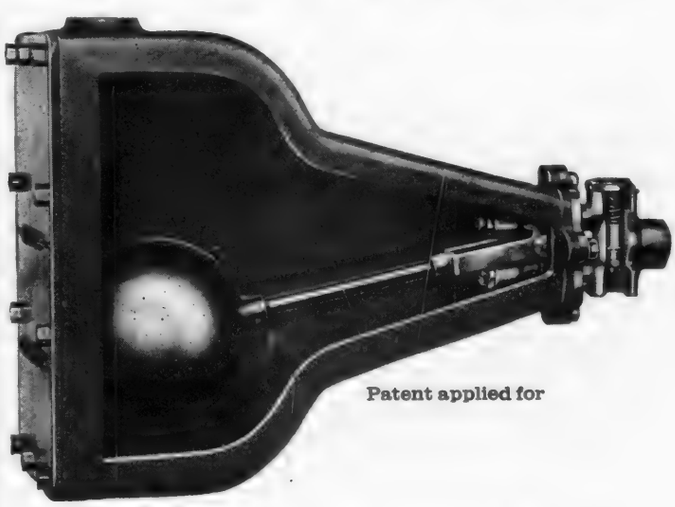
Breaking the Record for Low Coal Bills and Efficiency!

Low pressure steam and hot water heating boilers and tank heaters that burn No. 1 Buckwheat . . . . . No mixing with expensive coal . . . . . Magazine needs filling only once in 12 to 24 hours . . . . . No blower. No motor. No electric current. No machinery to get out of order . . . . . Twenty-one sizes . . . . . *Coal bills cut one half!*

Have you our Catalog and Price Sheets?

The **MOLBY**
HEATING BOILER
and **Heavy Duty Tank Heater**
MOLBY BOILER COMPANY
(Subsidiary of The Universal Pipe and Radiator Company)
New York: Graybar Building, 420 Lexington Ave.
Landsdale, Pa.: 41 Central Ave.

THERMOFLEX No. 2 DUPLEX AUTOMATIC BOILER FEEDER



Patent applied for

Positive and economical control of the water line of low pressure steam boilers. Inlet and overflow are controlled by one float.

For boilers using all types of fuel but particularly for those using gas and oil.

W. D. CASHIN COMPANY
35 HARTFORD STREET BOSTON, MASS.

Dollars and Cents Savings on Air Filter Installations

in Different Types of Buildings

Here is Valuable Data, Broadcast to Architects, Engineers and Building Owners—

AIR FILTER PROPAGANDA THAT BUILDS BUSINESS FOR YOU!

Backing up the well-known Midwest line of Automatic, Self Cleaning and Unit Air Filters, is an advertising campaign which gets down to brass tacks on the subject of savings and sanitation.

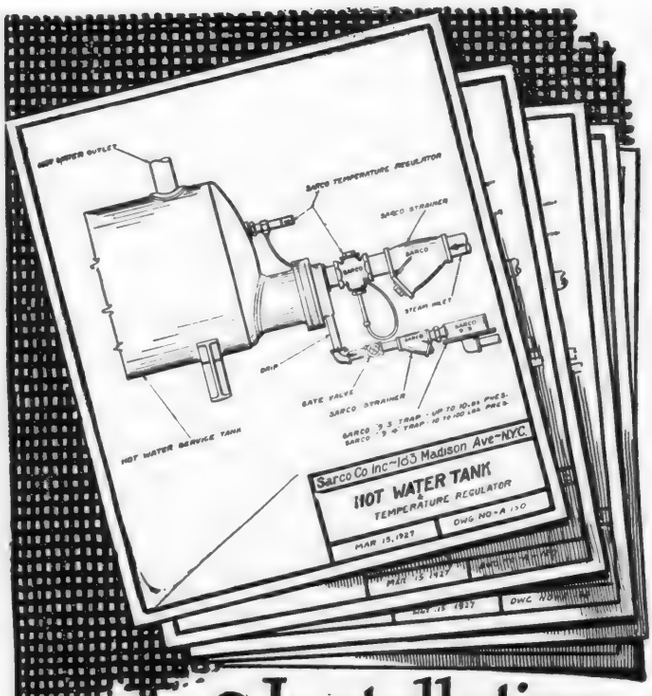
This data offers convincing proof of the value of air filtering systems in general, and should prove a valuable adjunct to the equipment of any ventilating engineer.

MIDWEST AIR FILTERS

INCORPORATED

Bradford, Pa.

Offices in Principal Cities



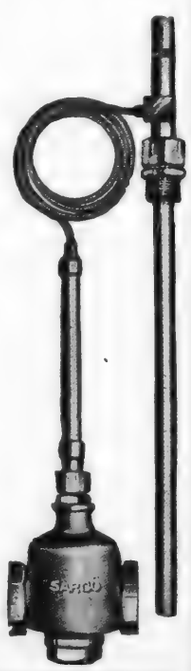
Free Installation Diagrams

In line with the Sarco practice of giving the trade every possible assistance, we are prepared to furnish, without charge, blue prints showing the methods we have found to be the most practical for installing Sarco Temperature Regulators for various purposes.

The above illustration shows a typical installation of a Sarco Temperature Regulator to the hot water tank. Most tank installations can be handled in this way. But in some instances special arrangements are necessary. In such cases we will gladly send installation plan if you will furnish us with details of the conditions to be met.

Our Engineering Department will gladly give you the benefit of many years of experience in temperature control without any obligation. When you have "tough nuts to crack", let us hear from you.

Write now for a copy of the above blue print and Catalog P-53.



SARCO CO., Inc.

183 Madison Ave., New York, N. Y.

Boston Chicago Detroit
Buffalo Cleveland Philadelphia

Adolf Frese Corp., Los Angeles
Peacock Bros., Ltd., Montreal

SARCO

Temperature Regulator

CISSELL
Duplex Boiler Feeder

BUILT TO MEET CONDITIONS EXISTING IN HEATING BOILERS

The CISSELL Duplex Boiler Feeder is a simple and positive means of controlling the water line in low pressure steam boilers, automatically supplying make-up water from the city mains and also protecting the boiler against flooding.

It will discharge any surplus water, caused by excess return condensation or any other cause, when same has reached a level of two and one-half inches above the normal water line.

DUPLEX FEEDER
Price, $50.00 F. O. B. Louisville

Sold with an absolute guarantee, or every dollar paid us will be refunded in full

Prevents Burning of Boilers or Cracking of Sections

Manufactured by

W. M. Cissell Manufacturing Co.
Incorporated

111 South Second St. Louisville, Ky.

CAPITOL

STA-PAK VALVES

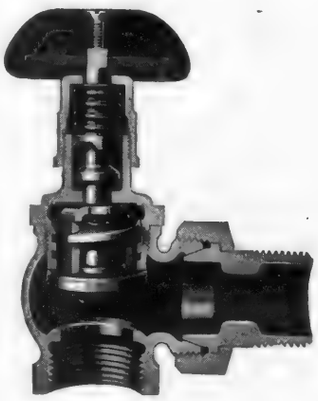
Sta-Pak Valves are high quality valves of the packless type, priced to bring in orders.

Once installed, the STA-PAK requires no further attention. No repacking is ever necessary.

It has a very high lift; one turn of the mushroom handle opens or closes it.

Manufactured of tested materials, STA - PAK Valves are quality products that will appeal to your customer. STA-PAK Valves are offered at attractive prices.

Write or wire for details.



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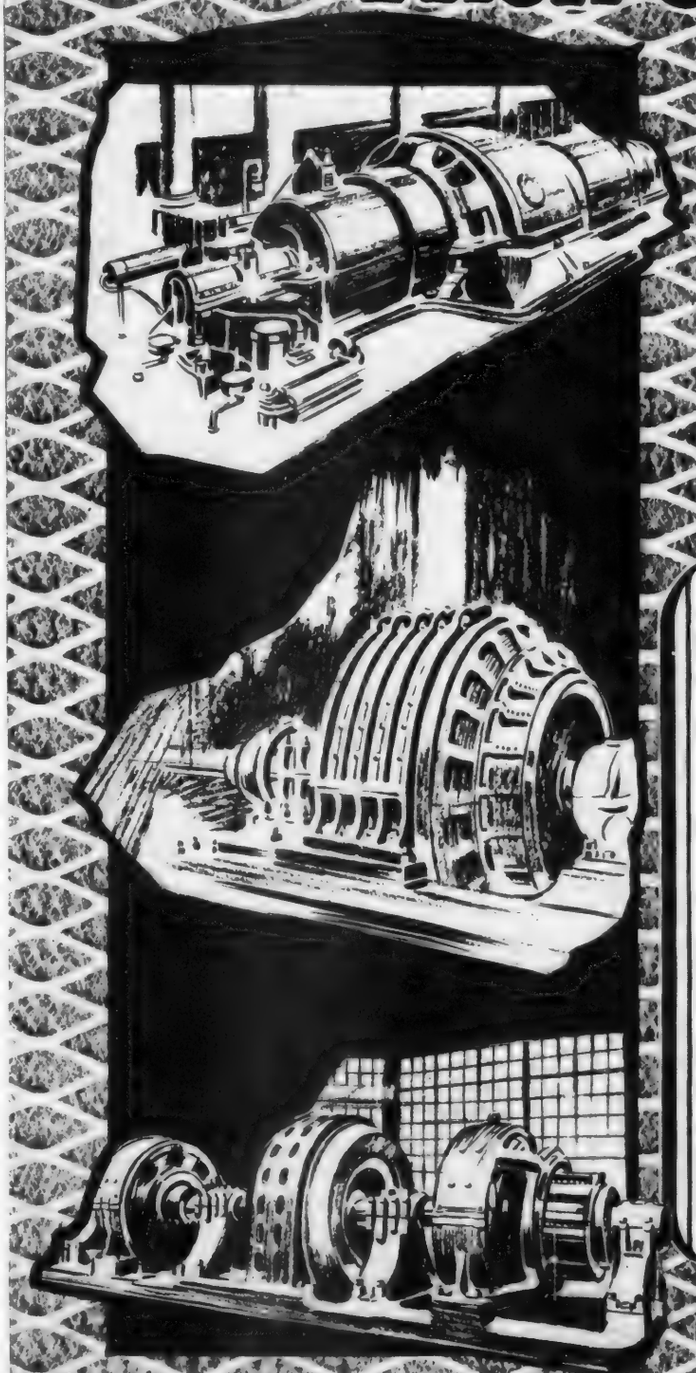

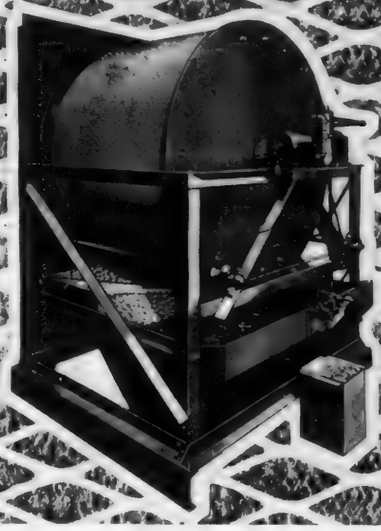

A Power in the Power Field

Mill Motors • Turbo-Generators • Rotary Convertors

A great part of the credit for the supremacy of the NATIONAL ROTARY in the ventilation of Electrical Equipment is due and, hereby, cheerfully acknowledged to leading Electrical Engineers throughout the country. Their cooperation and constructive criticism have made this achievement possible.

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Air Filtration, as applied to electrical equipment, has now taken its place as a real engineering problem. Therefore, an air filter should not be considered a "piece of merchandise," but should be selected the "engineering way."

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HIGGIN
ALL METAL Access Panel
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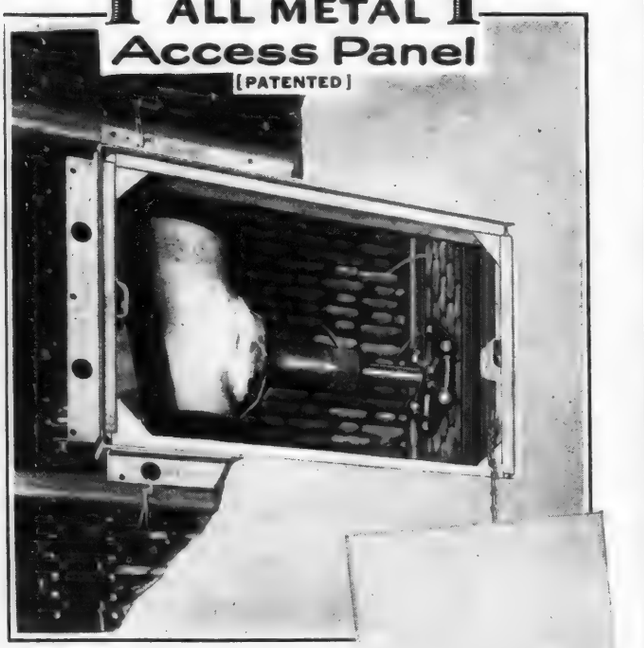

Showing installation of Higgin Access frame in Good Samaritan Hospital, Cincinnati, Ohio.

No chance for plasterer to seal this opening

The plasterer readily finishes his work around a Higgin Access Panel Frame. As frame is set before plastering, pipe fittings are p r o t e c t e d from mortar. Frame fits flush with wall surface in plaster, marble or tile, making an extremely neat appearance. Can be painted, decorated or papered over so that its inconspicuousness is complete.

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Just the thing for apartments, hospitals, hotels, residences, commercial and other buildings. Send for descriptive folder.

To release panel covered with paper, simply run knife or screw driver around edge of panel, then pry loose.

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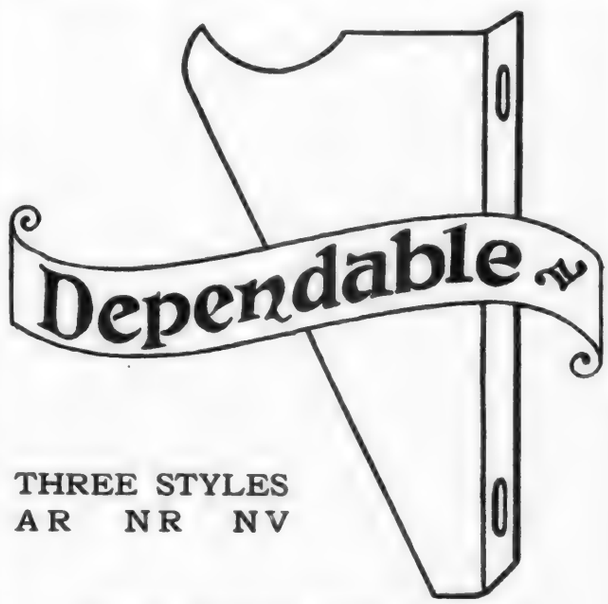

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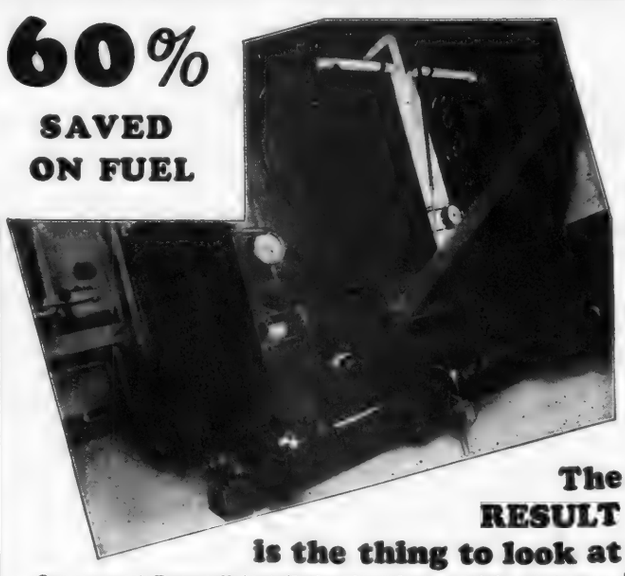

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Below: Part of an installation of Reed Streamline Automatic Filters cleaning 72,000 C. F. M.

THE architects for the Savoy-Plaza Hotel in New York knew the importance of clean, *filtered* ventilating air. What they were interested in mostly was a means of supplying it without the expense and trouble of maintenance. *The Reed Streamline Automatic Filter completely solved their problem.*

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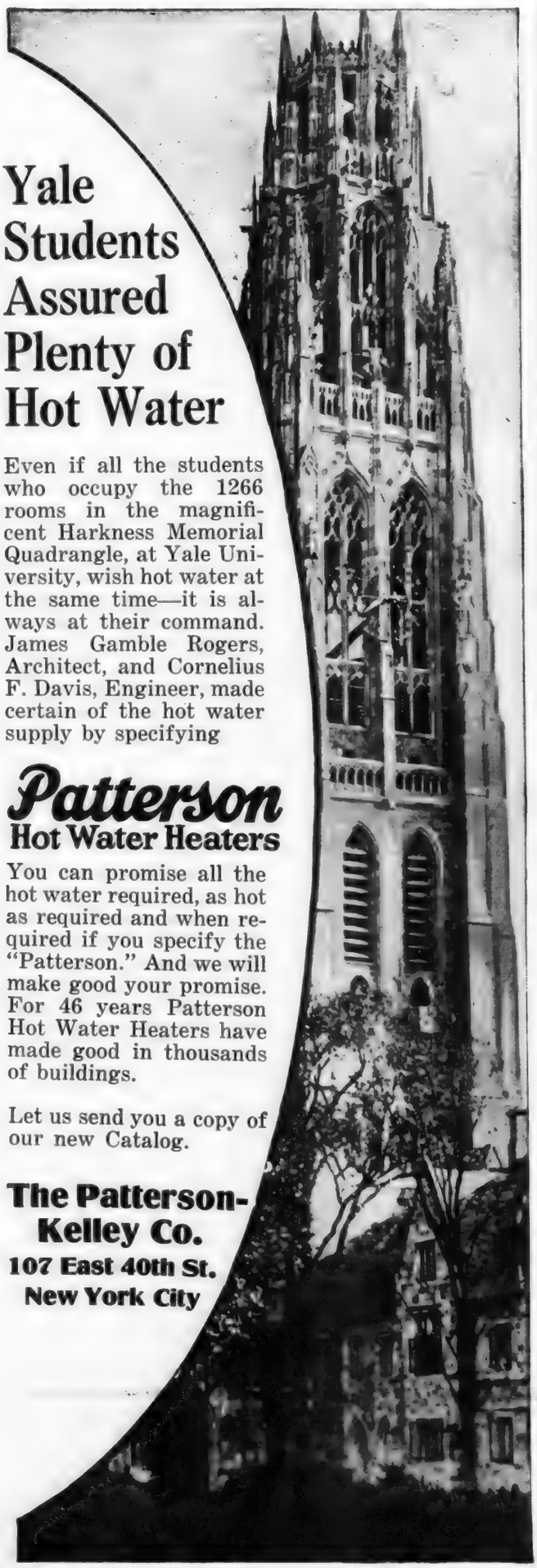

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THE HEATING and VENTILATING MAGAZINE
1123 BROADWAY, NEW YORK

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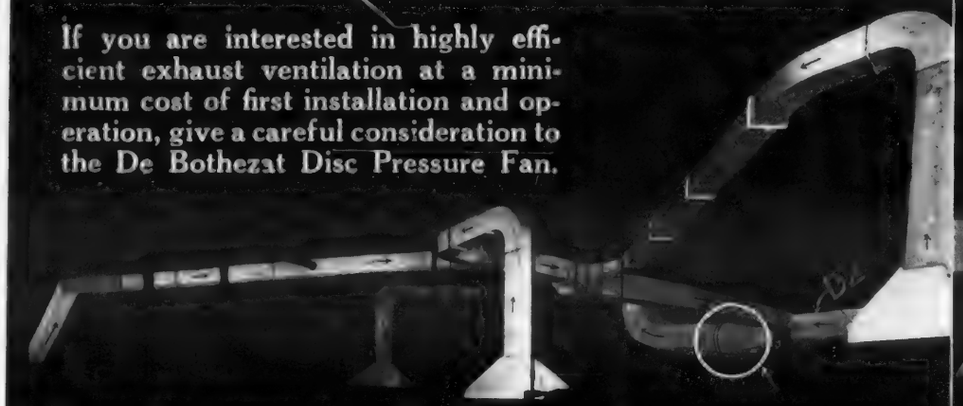

The total amount of hoods—altogether 20 in number—connected into a single duct system by about 380 feet of ducts of different sizes, including about 50 sharp bends, is taken care of by one single 36″ De Bothezat Disc Pressure Fan using only 2 H.P. for its operation at full speed. Through these hoods are

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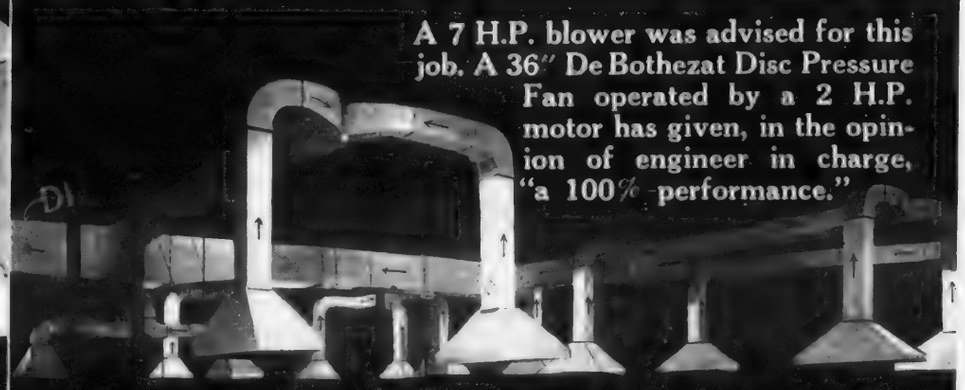

exhausted the heat and vapors from the laundry machinery distributed in this section (200′ x 200′ x 20′) of the Lackawanna Laundry, Summit Ave., Jersey City.

Note—White circle indicates location of the fan. The arrows indicate the direction of the air flow. In the left-top picture duct D2 constitutes the continuation of duct D1 of the right top picture.

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De Bothezat Disc Pressure Fans are unsurpassed.
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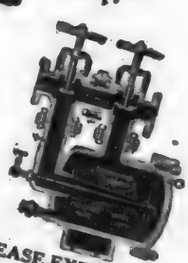
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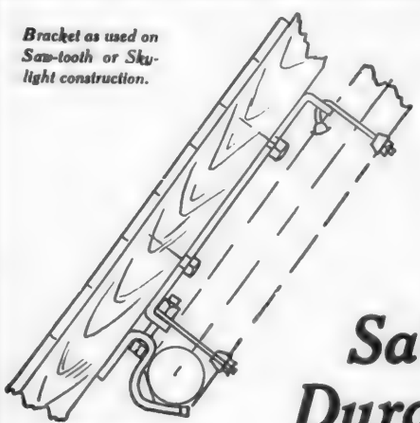

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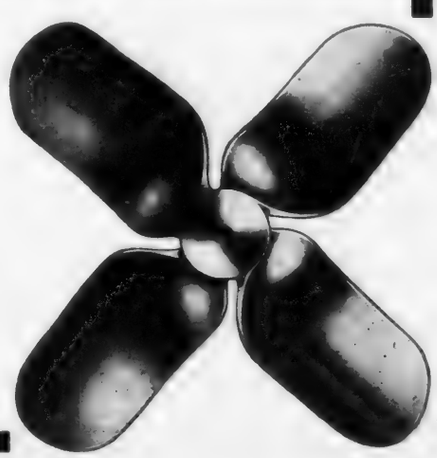

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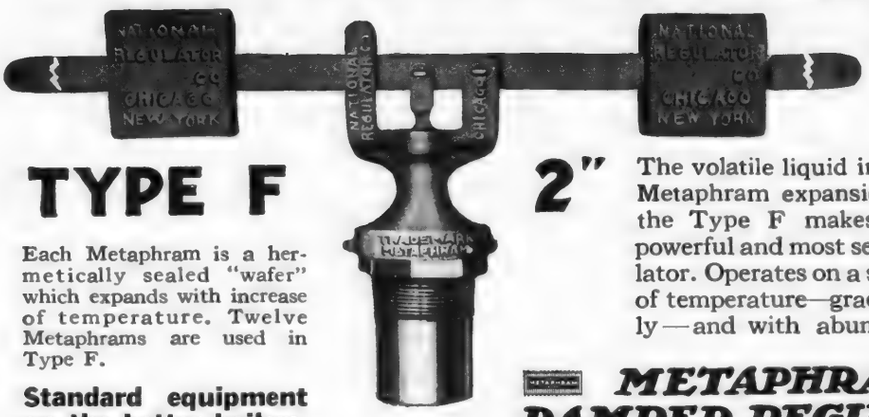
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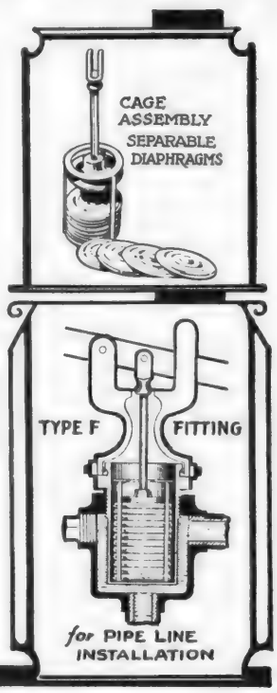

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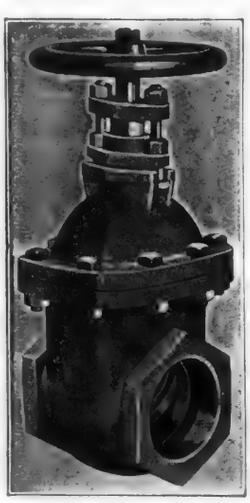

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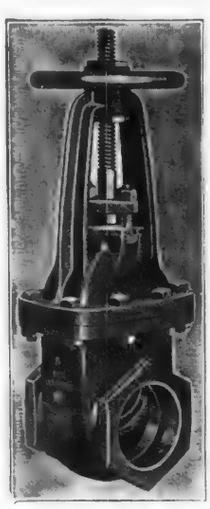

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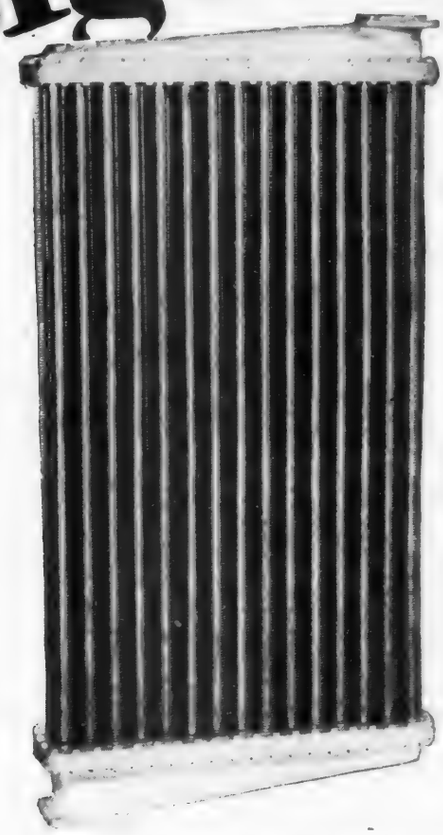

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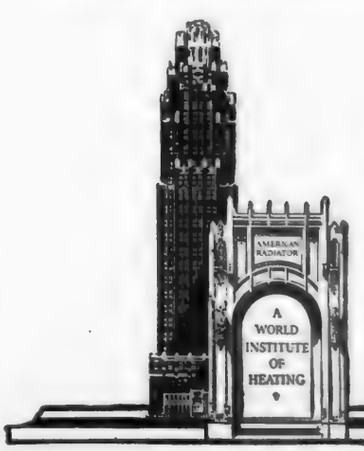
Send for your copy of our Engineer's Data Book on the Ideal ARCOBLAST Heater. Gives roughing-in dimensions, physical data, friction data, final temperatures, condensation and pipe sizes.



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For Permanence and High Efficiency

Specify

Rome Helicalfin Heaters

Helicalfin Heater Units and Radiators offer great advantages in high efficiency. The cores consist of tubes and headers made of copper and brass. They are sturdy, compact, light in weight, and last indefinitely with practically no corrosion.

Helicalfin Heater Units and Radiators are the ideal heating equipment for Homes, Schools, Institutions and Industrial Plants.

Rome Helicalfin Radiation has from five to nine times radiating surface of plain tube with proportionate increase in efficiency.

Engineering data covering the performance of Rome HELICALFIN Heaters has been prepared by a nationally known test engineer and is available upon request.

Standard Heater Units complete with steel casings for fan type heating and ventilating systems, ready for installation.

Standard and Special Heater Cores without Casings for manufacturers of Heating and Ventilating Apparatus.

Standard Copper Radiators for concealed direct radiation.

Condensers for Electric Refrigerators.

HELICAL Finned Seamless Copper Tubes in all sizes from 5/16" O.D. to 1¼" O.D. for any type Heat Transfer Equipment.

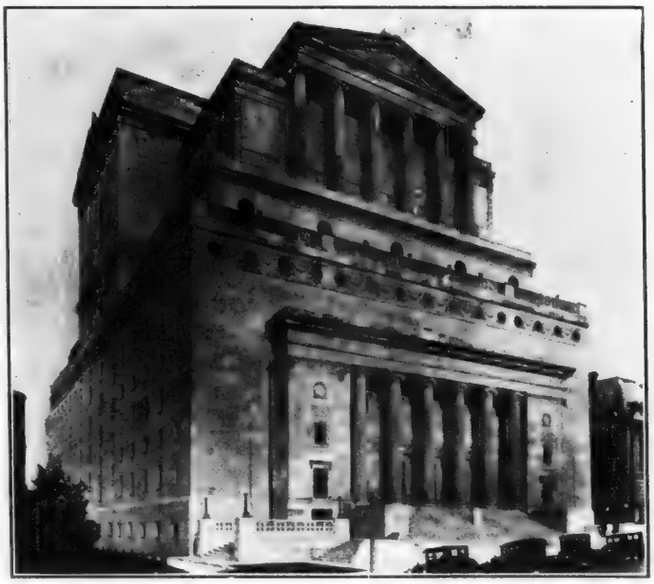
Cooling Systems and Radiators for Diesel Electric Locomotives, Gasoline Engines, Heavy Duty Trucks and Aeroplanes.

ROME-TURNEY RADIATOR COMPANY

ROME, N. Y.

Makers of Good Radiators since 1905

Quality—KIELEY—Simplicity



The St. Louis Masonic Temple heating system is supplied with Steam by Kieley Special "98" Reducing Valves. The Kieley "98" is particularly well adapted for use where quiet operation and dependability are required.

See these valves and other Kieley Specialties at Booths 533-534 in the New York Power Show.

KIELEY & MUELLER, Inc.

34 WEST 13th STREET NEW YORK CITY

Wiley

Safety-Vent Vapor Regulator

POWER IS ITS MIDDLE NAME

Makes any Vapor or Modulating System safe and satisfactory. Sensitive to the slightest change in pressure. Has ample power to control the dampers with a good working margin.

Full power of regulator is exerted within a pressure range of two or three ounces.

The Safety Vent Valve is a distinguishing feature of this regulator and takes care of air from entire heating system.

Tested and carefully adjusted before leaving factory, ready to be connected up and put into service, with the least trouble and expense.

All working parts of cast bronze. Will last as long as the boiler, or any other part of system.

Write for details

SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.

Announcing

THERMCOR

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The Perfected and Approved Unit Construction for Heating and Drying RADIATORS

Thermcor embodies all the elements so long sought by heating engineers and contractors.

GREAT RADIATING SURFACES
FREE FLOW OF STEAM OR WATER
LEAK PROOF AND LIGHT
GREAT STRENGTH

Thermcor Radiators are engineered exclusively for the manufacturers of heating and drying systems.

Complete Engineering Data on Request

THERMAL RADIATOR CORP.

140 South Dearborn Street,
CHICAGO, ILL.

No. 1 Pressure Regulator
Piston Type

Made in sizes ⅜ to 14 in. inclusive—Std. and Ex. Hvy. Sizes 1¼ in. and under made with bronze bodies—screwed ends only. Sizes 2 to 6 in. inclusive made with iron bodies—screwed or flanged ends. Sizes 7 in. and above made with iron bodies—flanged ends only.

KLIPFEL
PRESSURE REGULATORS

Automatically reduce any initial steam, air or water pressure to any desired reduced pressure above 2 lbs.

Maintain reduced pressure constantly regardless of fluctuations in boiler pressure, or changes in the demand for steam.

Simple, rugged and direct acting. As low pressure builds-up and exerts pressure under piston, a balance is formed between low pressure and weighting, which in turn regulates the inner valve opening.

Visible in action. Lever may be used to open, close or test by hand. Position of inner valve may be easily judged by looking at the lever.

Bronze cylinder, multiple grooved piston and balanced plunger type bronze inner valve. All working parts removable while valve body remains in the pipe line.

No troublesome springs, toggles, packing boxes or pilot valves. Dashpot included, which insures steady service pressure and overcomes any tendency of valve to chatter or vibrate.

Guaranteed to closely regulate at both maximum and minimum steam loads. Sound mechanical principles with the highest grade of material and workmanship insure perfect performance.

KLIPFEL MFG. CO., 2641-59 W. Harrison St. CHICAGO, ILL.

Manufacturers of a Complete Line of Steam Specialties including Pressure Regulators (Both Piston and Diaphragm Types)—Float Valves—Back Pressure Valves—Thermostats—Auxiliary Operated Valves and many other Specialties. Write for Catalog No. 26.

Don't fail to visit Booth 451 Pitts & Kitts Mfg. and Supply Co. at the National Exposition of Power and Mechanical Engineering.

Repeat Orders Reflect Satisfactory Service

"We keep others in Hot Water"

Note the following copy of sales record:

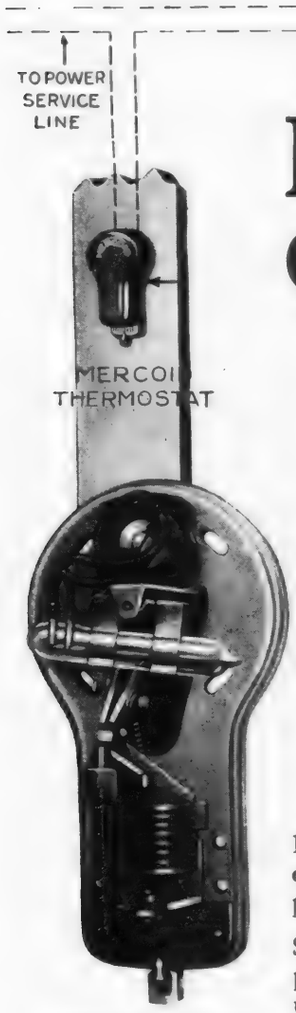
Endicott-Johnson Co.,
Endicott, N. Y.

September, 1916	2	storage heaters
June, 1917	2	" "
June, 1921	2	" "
October, 1921	1	" "
March, 1923	2	" "
April, 1923	1	" "
November, 1924	1	" "
January, 1925	1	" "
December, 1926	2	" "
Total	14	storage heaters.

FURNISHED BY

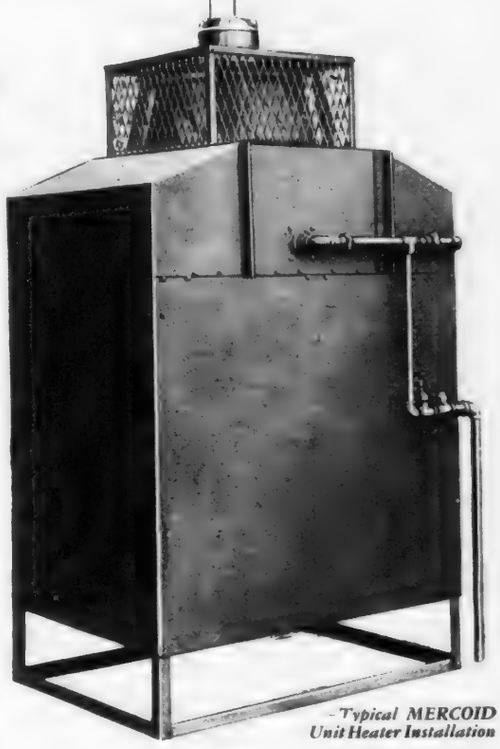
THE SIMS COMPANY, Erie, Penna.

MERCOID



MERCOID Thermostat No. 845 with cover removed. To prevent tampering a lock-and-key attachment is available.

MERCOID CONTROLS *improve* all types and makes *of* UNIT HEATERS



Typical MERCOID Unit Heater Installation

Every unit heater installation can be equipped with Automatic Control—simply and inexpensively—with MERCOID.

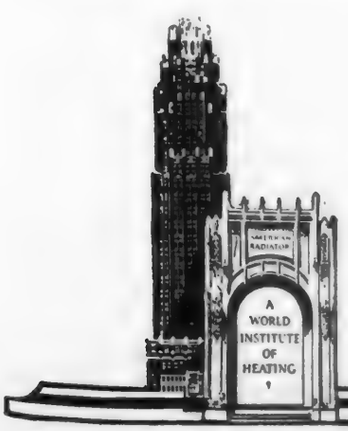
Simplicity of installation is one of the principal reasons why MERCOID is so universally employed with unit heaters.

The No. 845 MERCOID thermostat is easily and quickly attached to a post or column of the room, a direct wire connection is made to the fan motor circuit—and the installation is complete.

When the room temperature reaches the desired degree MERCOID automatically stops the fan. When the temperature falls MERCOID starts the fan again. No more watching the thermometer—no more task of starting and stopping the fan by hand—no more workers loggy from too much heat or chilly from too little heat.

MERCOID combined with ARCO Motor Valve can be hooked up so that both fan and steam can be controlled automatically.

MERCOID Thermostats for Unit Heaters are furnished with two standard ranges—56° to 80° and 38° to 60°. Higher or lower temperatures can be supplied. The operation of the MERCOID sealed mercury switch is perfectly safe in the presence of explosive vapors and gas. No open arc. MERCOID No. 845 is listed as standard by Underwriters' Laboratories, Inc. MERCOID operates on regular line current 110 or 220 V. A.C. or D.C. On motors drawing more than 10 amp. at 110-V. an automatic starting switch is used. Send for complete data on MERCOID Controls for Unit Heaters.



AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION

816-20 South Michigan Avenue Chicago, Illinois

Makers of:—

AIRID AIR VALVE No. 500

ARCO PACKLESS VALVE No. 988

ARCO WATER REGULATOR No. 800

DETROIT EQUALIZING VALVE No. 104

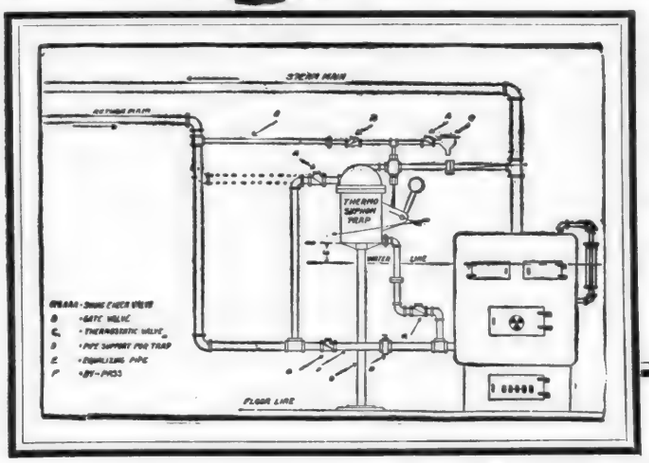
MERCOID CONTROLS

For All Types of Steam Heating Systems

Don't wait until the boiler tells you

Because if you wait for the boiler to let you know that it needs a Thermo Syphon Trap it will be to the tune of a large crack,—and then too late. A little precaution in the beginning saves costly replacements and inconvenience. The Thermo Syphon Trap returns all condensation to the boiler, maintaining the water line, regardless of pressure or vacuum. It prevents the burning or cracking of boilers due to water leaving the boiler or becoming locked in the system. It improves circulation and insures noiseless operation. Prevents air-bound or water-logged conditions. Safeguard for all types of vapor or atmospheric systems.

Send for Bulletin No. 16-HV giving full details.



Application of Thermo Syphon Trap, showing proper method of piping, for draining any heating system.

For draining vapor, vacuum or any system *without pressure on the returns*, the return line may be run direct to inlet of trap as shown by dotted line.

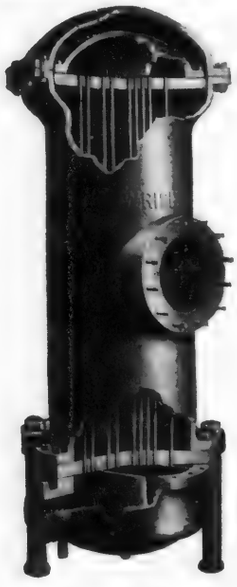
LYTTON MANUFACTURING CORPORATION

FRANKLIN, VIRGINIA

HIGH GRADE Return, Vacuum, Lifting and Separating Steam Traps, Reducing Valves, Blow-off Valves.

THERMO SYPHON TRAP

HEATING SYSTEM CONTROL FROM THE POWER PLANT



THE largest single hot water heating system in the world, located in New York City, serving a group of buildings of approximately eight city blocks, is regulated entirely from the power plant by hourly inspection of outside temperature and adjustment of the steam pressure in Wainwright heaters, and the speed of the Wheeler circulating pumps forcing the water through the heating system.

A single season's experience furnished the necessary data for predetermining the outgoing water temperature necessary for comfortable heating results at various outside temperatures and individual control of the thousands of radiators in hotel and office rooms served from this plant is entirely avoided.

(See our Booth No. 64 at the Power Show.)

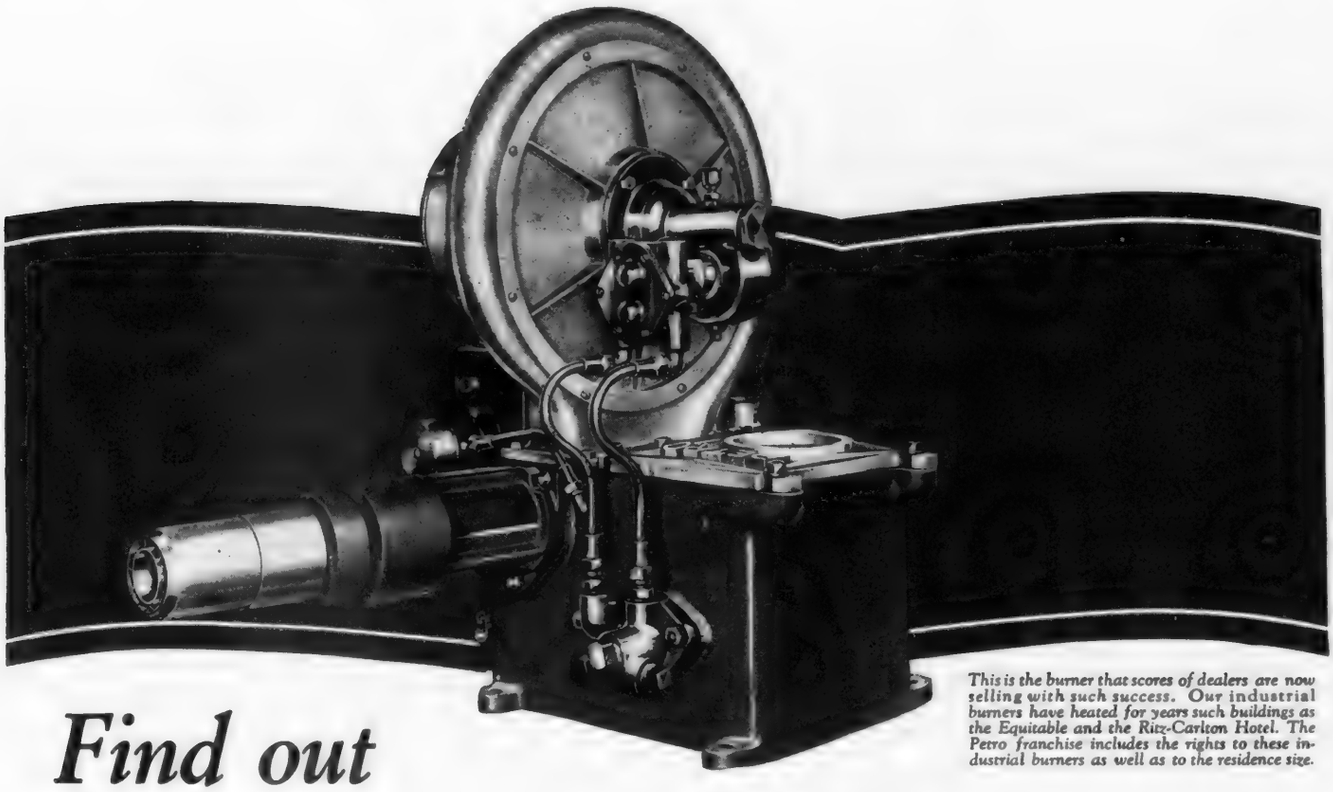
Foster Wheeler Corporation

A Consolidation of Power Specialty Company and Wheeler Condenser and Engineering Company

165 Broadway, New York, N. Y.

Branches in All Principal Cities.

26



This is the burner that scores of dealers are now selling with such success. Our industrial burners have heated for years such buildings as the Equitable and the Ritz-Carlton Hotel. The Petro franchise includes the rights to these industrial burners as well as to the residence size.

Find out about this BURNER!

Don't let another week pass by without knowing all about the Petro—and our unique selling plan that helps you build up a sound, profitable business.

ALREADY oil burner dealers are having the most amazing success with the Petro.

J. L. Mueller, of York, Pa., changed to Petro and increased his sales nearly 300 per cent the first year! Other dealers report remarkable sales records even in difficult markets!

Yet it is not hard to understand why these men are selling burners so fast. In the first place, the Petro is like no other burner on the market. It is not new, or experimental—it is a product of over twenty-four years' experience in the industrial burner field.

The most conservative engineering authorities are hailing the Petro as the final word in modern oil heating!

Then, secondly, our new selling plan. Already it has proved beyond question that it gets results right away. We think you will agree with other dealers who say it is the most helpful selling plan they ever saw. With it, you can get customers that other dealers simply cannot reach!

Can you afford to wait any longer? Can you remain satisfied with only half-success? Mail the coupon today and get our proposition to look over. Examine it carefully—then make your decision.

But you must act without delay. Rich territories are going fast! Clip out the coupon *now* and put it in the mails.

PETRO

REG. U.S. PAT. OFF.

RESIDENCE OIL BURNER

A product of Petroleum Heat and Power Co.

(Makers of oil burners since 1903)

Tested and listed as standard by the Underwriters' Laboratories. Approved by the Board of Standards and Appeals, New York City. Approved by the Department of Public Safety, Commonwealth of Massachusetts

H.V. 12

Petroleum Heat and Power Company
511 Fifth Ave., New York, N. Y.
Gentlemen:

I am interested in becoming a Petro Dealer. Please send me information about the Petro and your new selling plan.

Name.....

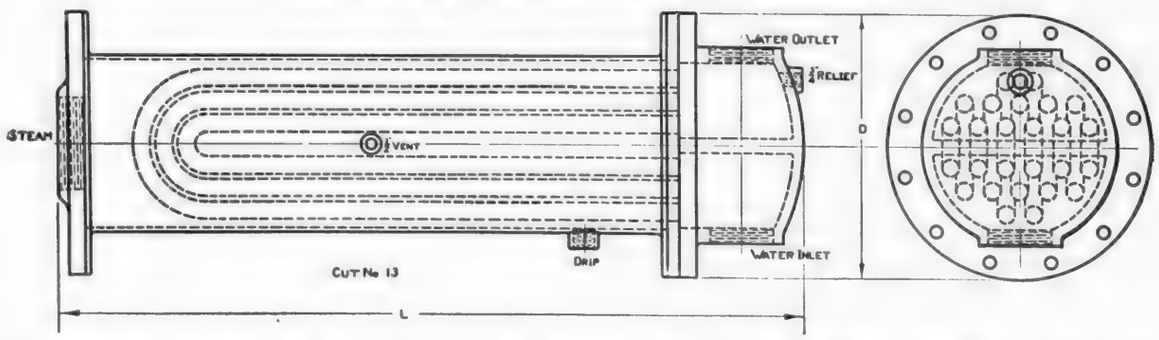
Address.....

City..... State.....

NATIONAL

PREHEATERS or U BEND TYPE Condensation Coolers

soon pay for themselves in saving heat lost through discharge of heating systems



Much heat is lost in allowing the condensation discharge from the heat you buy to pass off into the sewer. By using a National Preheater or Condensation Cooler, the condensation passes through the heater where the U bend element extracts the heat still in the condensation and uses it for domestic hot water supply. You also eliminate trouble resulting from high temperature condensation emptying into the sewage system.

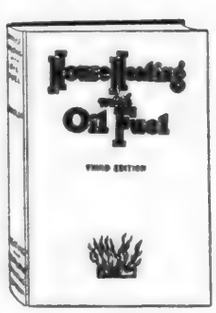
Furnished in All Sizes. Write for Quotations.

THE NATIONAL PIPE BENDING CO.

120 River Street, New Haven, Conn. **Boston—New York—Philadelphia**

HOUSE HEATING WITH OIL FUEL

By **P. E. FANSLER,** *Associate Editor, The Heating and Ventilating Magazine*



This publication has been prepared for the use of the heating and ventilating engineer, the heating contractor, those engaged in the oil-burning industry, and the user and potential user of oil-burning equipment. Over a dozen beautiful and spectacular flame photographs were made particularly for this book in order that the subject of oil combustion might be more thoroughly presented.

362 PAGES **MORE THAN 150 ILLUSTRATIONS** **PRICE $4.00**

Published by

HEATING AND VENTILATING MAGAZINE CO.

1123 BROADWAY **NEW YORK CITY**

Service **The** **Satisfaction**

VECO SYSTEM of VAPOR HEATING

Valuable help for the contractor
Engineering service by Vapor Experts
Complete plans and specifications
Our systems fully guaranteed

VAPOR ENGINEERING COMPANY

PHILADELPHIA—10 So. 18th Street
J. Wilbur Glassey—M. S. Buck

NEW YORK—489 Fifth Avenue
Chas. E. Scott—R. C. Willis

The world's *largest* Dry Cleaning Plant *chooses*

JOHNSON Oil Burners

Last March the Vogue Dry Cleaning & Dyeing Company opened its new building in Washington, D.C.

With the world to choose from, Samuel Goldenberg, President, selected JOHNSON ROTARY OIL BURNERS ***for his heating equipment!***

JOHNSON *Oil Burners*

are approved by Underwriters' Laboratories, the New York Board of Standards and Appeals, and Fire Prevention Bureaus of principal cities.

A Complete Line for Every Purpose—There is a size and type of Johnson Burner for every heating and power need. Thousands are giving satisfactory service in every type of building ... from New England to California ... from Florida to the Pacific Northwest ... and in foreign lands. ⟵ ***Some Territory Still Available for a Few Dealers.***

S. T. JOHNSON CO.
OIL BURNERS
TRADE MARK REGISTERED

Main Office and Factory, 946 Arlington Avenue, Oakland, California
Factory Branch Offices: San Francisco, Sacramento, Philadelphia
Distributors and Dealers throughout the United States and in Foreign Countries.

4327

DO you know how many nationally famous products are made with the help of Whitlock Heaters?

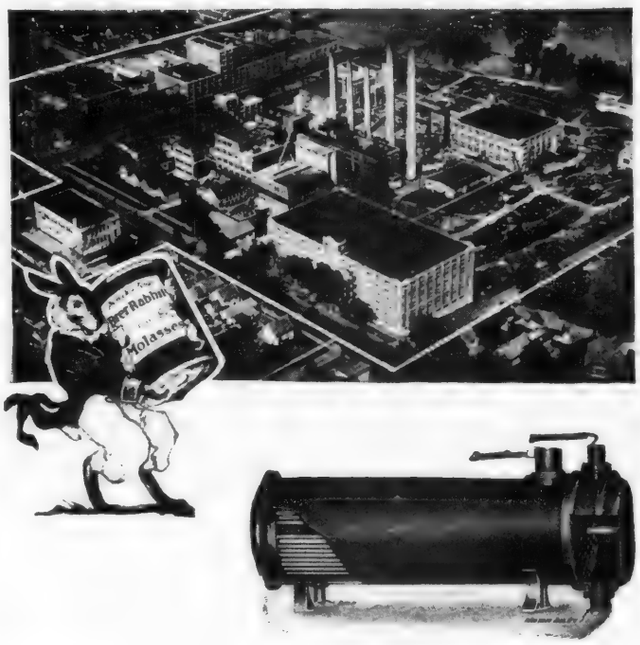
Well, neither do we—we never tried to count them—but there are a lot.

From morning to night you eat, wear and use articles which are made in plants using Whitlock Heaters for heating water and various other liquids.

We are proud of this endorsement of Whitlock Heaters by the best and largest industrial concerns in the country—and it should mean a lot to you.

It is a guarantee that Whitlock Heaters are dependable—you are safe when you specify or buy a Whitlock.

Call the nearest Whitlock Engineer, or write to us directly.



THE WHITLOCK COIL PIPE COMPANY

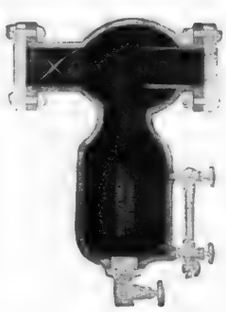
40 South St., Hartford, Conn.

New York, Boston, Philadelphia, Chicago, Baltimore, Detroit, Los Angeles, San Francisco, and other principal cities. Consult telephone book.

WHITLOCK HEAT TRANSFER PRODUCTS

SWARTWOUT

Steam Separator



99% Dry Steam Guaranteed.

Either cast iron or cast steel.

Swartwout Bucket Type Steam Trap
Swartwout Return, Lifting and Vacuum Trap
Swartwout Steam Separators—Receiver Type
Swartwout Low Pressure Float Trap
Swartwout Air Separator
Swartwout Cast Iron Exhaust Head
Swartwout Cast Iron Strainer

THE SWARTWOUT CO.

General Offices: **18525 Euclid Ave., Cleveland, Ohio**

Factories: **Cleveland and Orrville, Ohio**

CUT COAL BILLS
Pyramid Grates Do It

Owners of buildings of all types have cut their coal bills radically by using Buckwheat Coal.

You can burn Buckwheat with PYRAMID GRATES

Let Us Send Full Details

PYRAMID IRON PRODUCTS CO.

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Absolute Dependability since 1886

SCOTT

A COMPLETE LINE OF BRONZE — IRON-BODY

VALVES

- built for long life

SCOTT VALVE MFG. CO.
DETROIT MICH.
"MAXIMUM SERVICE PER DOLLAR"

All Monroe Automatic Oil Pumps are driven by the Janette Motor—the small motor in oil pump service correctly designed for vertical operation. No noise — no vibration. Long life.

Pump Performance Records

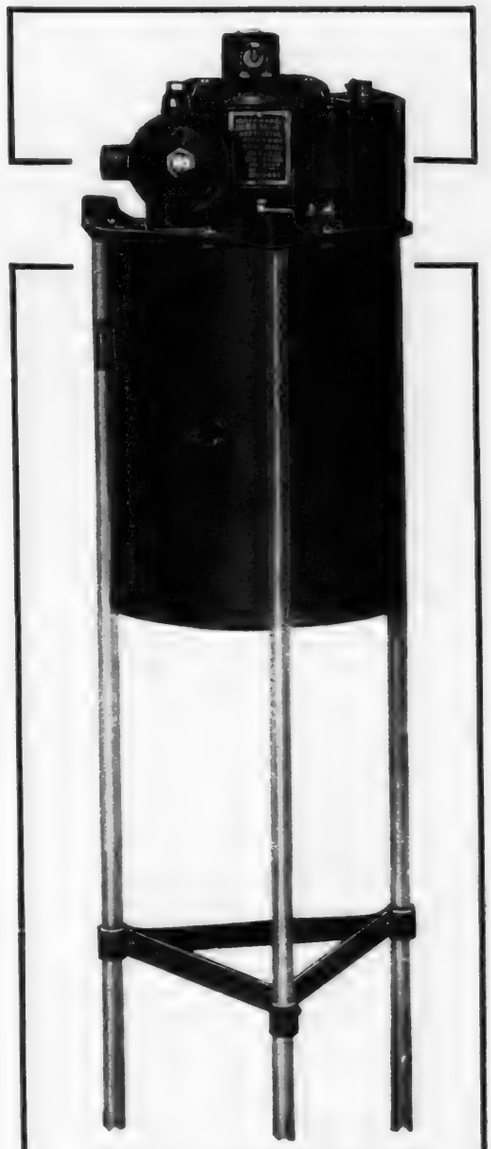
Year after year, Monroe Automatic Oil Pumps have established unsurpassed records of performance. Each year sees a greater and greater number of Monroes that have gone through the season with a "clean slate"—no service calls required.

Hundreds of Monroe Automatic Oil Pumps have been in operation for years without requiring a single service call. Thus the profits that a dealer makes in Monroe Pumps are real and permanent—not quickly wiped out by service calls.

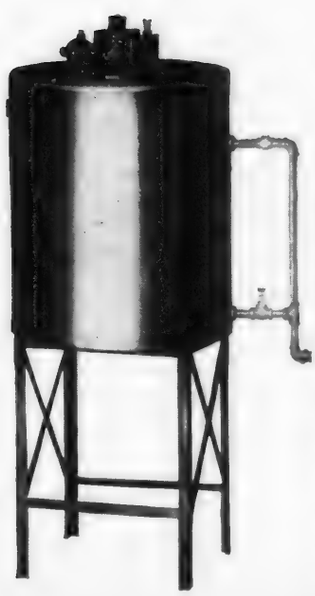
The Monroe Pump stands out by itself for ruggedness of construction, quality of materials and length of life. *Guaranteed for 5 years.*

Write for full description and dealer discounts

MONROE
MACHINE TOOL COMPANY
NEW YORK SINGER BUILDING 149 BROADWAY
737 W. Jackson Blvd. — CHICAGO
17 YEARS EXPERIENCE MANUFACTURING PUMPS
PHILADELPHIA REAL ESTATE TRUST BUILDING



Monroe Automatic Oil Pump Type TJU. A rugged heavily built pump listing at $75.00. Tested and listed as standard by Underwriters' Laboratories.

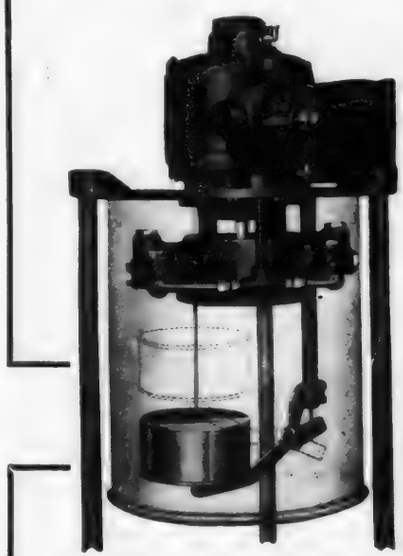


For the Prospect Who Wants Additional Protection— THE MONROE TYPE TJF

Many of your oil pump prospects will insist on having the Monroe Type TJF, once you've shown it to them.

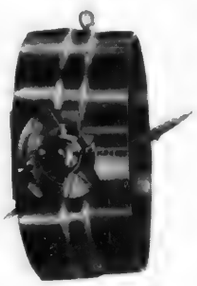
This pump has been designed to overcome the results of the homeowner's biggest failing, namely: letting his oil tank go dry. When this happens, the reserve supply of 35 gallons always carried in the Monroe Type TJF will tide him over until his tank is refilled.

A mere shutting down of electric power does not prevent the owner of a *natural draft oil burner* from having continuous heat. He merely cuts in the reserve supply of oil contained in the Type TJF, always enough to last him until the power is again turned on.



"Ghost" view of Type TJU. Compare the construction of this pump with that of lighter, less durable types.

Will You Be Sorry or Certain?



Preferred 100% Automatic Damper

The good results of many oil burners are being jeopardized by unscientific accessories.

Preferred Utilities allow the oil burners to do full justice to its ability.

You will get preferred results from Preferred utilities when you use them. You will get satisfaction instead of trouble and service calls.

Preferred Foot Valve

Preferred utilities are preferred because they are practical in performance and price. They are designed and manufactured for the oil burning industry by oil burning engineers who have been in the oil burning field for years.

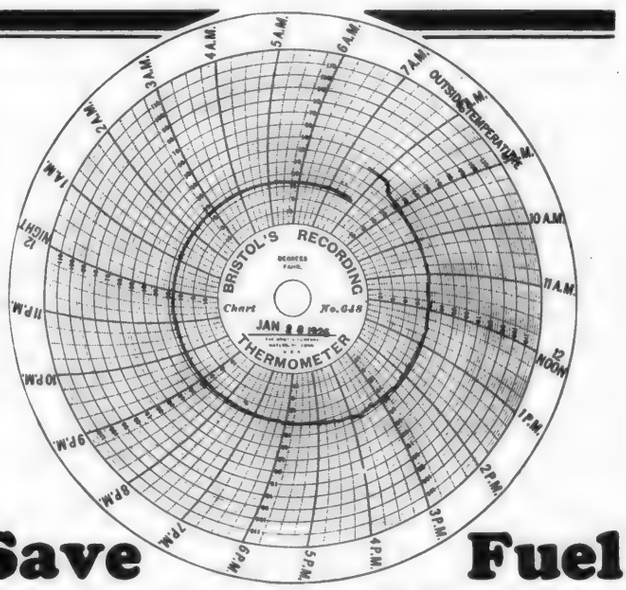
Cross section Preferred Foot Valve

Preferred Utilities:

Preferred 100% Automatic Damper
Preferred Foot Valves
Preferred Anti-Syphon Valve
Preferred Double Tapped Bushings
Preferred Flush Boxes
Preferred Vent Protector
Preferred Domestic Hot Water Control Panel

Other Preferred Utilities in our laboratory and on test in the field.

PREFERRED UTILITIES MANUFACTURING CORP.
33 West 60th St., New York, N. Y.



Save Fuel

By Keeping a Check on Out-Door Temperatures

Greater economy in boiler room operation is possible when the engineer can direct firing operations under the guidance of continuous chart records of out-door temperature.

Note how clearly the record line on the above chart shows the gradual drop in temperature. Starting at about 40° at 7.40 o'clock in the morning a drop of 30° is recorded up to the same time the next morning. As a result of having such a chart for reference, demands on the heating system can be anticipated and more uniform firing assured.

Bristol's Recording Thermometers are of sturdy construction; simple and direct in operation, and will give years of dependable service without trouble. Write for complete information.

The Bristol Company
Waterbury • • Connecticut

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 450° F.
Our No. 2600 metal for temperatures below 1500° F.
Other High Heat Metals for special uses.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
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As Simple as the Ordinary Kerosene Lamp

LACO OIL BURNER

Made in five adaptable sizes; guaranteed to heat the home or building to the maximum capacity of the heating plant. Economical. Proved by thousands of trouble-proof installations throughout the country. Write today for dealer terms and full particulars.

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GRANT ACCESSORIES CORPORATION
107 LIBERTY STREET
NEW YORK

Grant Packless Twin Compound Reduction Pump
Bulletin C R 4000

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OIL BURNER EQUIPMENT
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Grant Packless Pressure Pump
Bulletin P 1000

Oil Burner Manufacturers,
Everywhere.

Gentlemen:-

We have recently perfected a line of small oil pumps for direct motor connection. These pumps are very quiet in operation at either 1750 or 3400 R.P.M.

Our Single Pump will deliver oil in pressures up to 25 pounds.

Our Step-Up Pressure Pump will deliver oil in pressures up to 250 pounds.

Our Twin Pump is designed for the purpose of maintaining an oil level without the use of floats. In this unit, one pump draws the oil from the outside storage tank and discharges into a small oil sump. The second pump draws the surplus oil from the sump and returns it to the oil storage tank, in this way maintaining a level at the burner.

These pumps are all tested for a suction of 14 inches of mercury and do not need to be primed; capacities are 15 gallons per hour. Due to our patented feature which eliminates the packing glands, a minimum of power is required.

As these pumps are made for clock wise or counter clock wise rotation, it is necessary, when ordering these units, to designate which rotation is required for your purpose.

Very truly yours,
GRANT ACCESSORIES CORPORATION.

Motored Low Pressure Blower
Bulletin M B 900

Grant Packless Pressure Pump
with low pressure blower
Bulletin P 1000 B

Grant Packless Twin Pump
with low pressure blower
Bulletin T P 2000 B

Grant Packless Twin Pump
Bulletin T P 2000

Grant Oil Strainer
Bulletin S 600

Automatic Shut Off Valve
Bulletin A.S.V. 500

Grant Packless Twin Reduction Pump
Bulletin R 3000

Operates Silently

You wouldn't know an American Anti-Siphon Valve was in operation, it works so silently.

If there is a break in the pipe line or the pump stops, it automatically shuts off the oil and prevents damage. That permits burying the oil tank just below the surface of ground instead of digging a deep hole to get tank below the burner.

Saves cost of digging, so enables you to quote lower prices and get more orders.

Listed as "standard" by Underwriters' Laboratories and approved by Factory Mutual Ins. Co.

Write for Catalog 14-1590.

AMERICAN SCHAEFFER & BUDENBERG CORP.
338 Berry St., Brooklyn, N. Y.

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Direct Factory Representatives for Eastern Canada.
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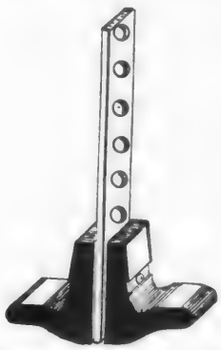
AMERICAN
ANTI-SIPHON VALVE
AND STRAINER

Sterlco
TRADE MARK

"KWIC-LIFT"
MOST PRACTICAL
CEILING RADIATOR
HANGER MADE

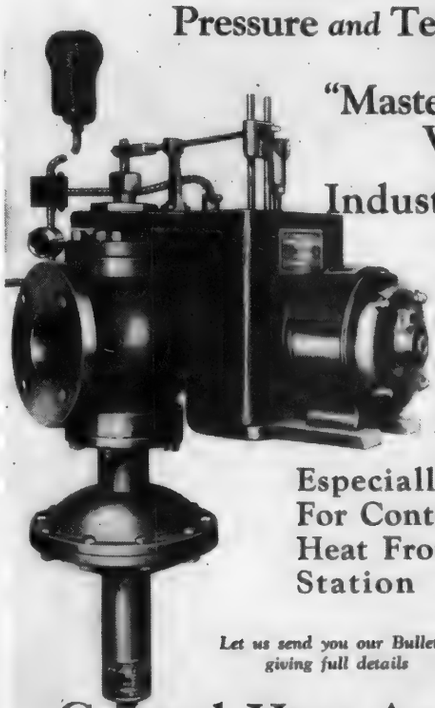


Inserted Between Columns of Radiator

Ask Your Jobber For Them

STERLING ENGINEERING CO.
1640 Holton Street MILWAUKEE, WIS.

HORNUNG
Pressure *and* Temperature
2 *in* 1
"Master Control" Valve
(PATENTED)
Industrial Type



Motor Operated Directly by Thermostat

All Relays Eliminated

Especially Designed For Control of Steam Heat From a Central Station

Let us send you our Bulletin giving full details

Central Heat Appliances
J. C. HORNUNG, *Engineer*
343 South Dearborn Street Chicago, Illinois
(3475)

"If you can get the Silent Glow Franchise Snap on to it!"

*Gathering of Silent Glow New England dealers at their Annual Sheep bake**

Hear What THEY Say!

" . . . . up to its capacity there is nothing at any price that can touch it."

" . . . . let's see you equal that with any burner you know of."

" . . . . we do not get service calls and don't expect any."

" . . . . every burner that you sell will deliver 100% satisfaction."

" . . . . they are selling far beyond our expectations."

" . . . . you have never invested a like amount of money that will turn you the results Silent Glow will."

" . . . . if you can get a Silent Glow franchise, snap on to it."

**Silent Glow has a dealer turnover of less than 1%.*

There are still some Silent Glow Franchises available in New York, New Jersey and Pennsylvania.

SILENT GLOW OIL BURNER CORP.

191 Franklin Avenue

HARTFORD, CONN. Dept. V

Silent Glow Oil Burner Corp.—Dept. V,
191 Franklin Ave., Hartford, Conn.
Please send me full information about Silent Glow Oil Burner and Silent Glow Franchise.

Name .....

Street .....

City ..... State .....

BASEL VALVES AND HEAT REGULATORS

Float

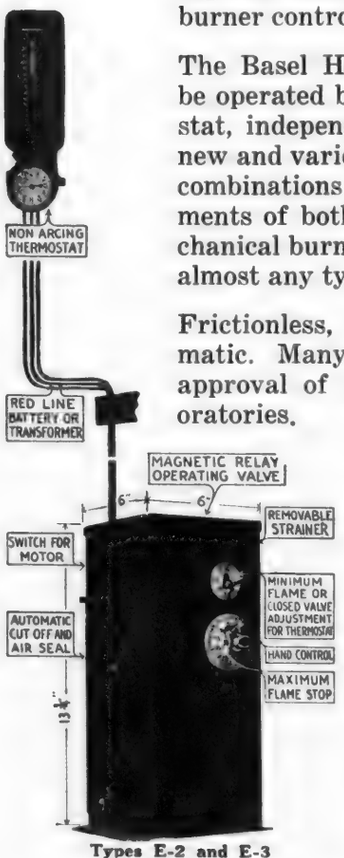
for OIL BURNER efficiency!

Strainer

To obtain the highest efficiency from an oil burner it should be properly controlled. Our engineers have devoted a number of years to the study of this important phase of the oil burning industry and have developed a line of oil burner valves and heat regulators which is successfully meeting the increasing demand for oil burner control equipment.

The Basel Heat Control System can be operated by hand or from thermostat, independent of the other. The new and various types of controls and combinations meet all the requirements of both natural draft and mechanical burners. There is a type for almost any type of oil burner.

Frictionless, Packingless and Automatic. Many types have the stamp of approval of the Underwriters' Laboratories.



Types E-2 and E-3 Heat Regulators

The E-2 will operate either a natural draft or blower type burner, from minimum flame to maximum flame, or from closed valve position to maximum flame, as desired, leaving the blower in constant operation.

The E-3 is identical with the E-2 except that it contains a mercoid switch for turning on and off the motor from thermostat at the same time that the valve is closed to a minimum flame or to a completely closed position as desired.

Let our Engineers assist you. The rest of the story is told in a booklet. If you haven't one, please write.

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Equally Dependable

for STEAM, WATER, GAS, OIL or AIR

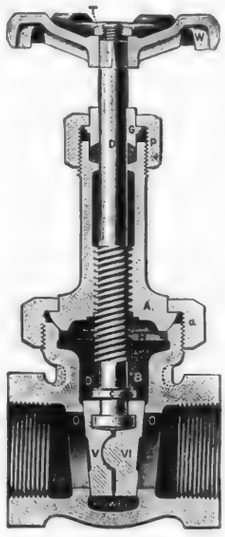

Fig. 375 Rising Stem Gate Valve

POWELL White Star Gate Valves

Double Wedge Powellium Nickel Discs.

Union Bonnet.

For 200 pounds, Extra heavy for 300 pounds W.S.P.

Order from your dealer

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THE WM. POWELL CO.

Dependable Engineering Appliances

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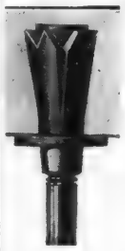

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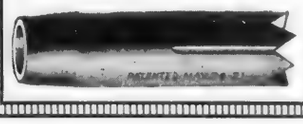
Make their own hole and stay tight permanently. Quick, economical and reliable. Shells are sharp and tough, and easy to install. Have U. S. Standard threads for rods, bolts and screws. Installed by hand or with Phillips Spring Hammer. No drills required.



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The Down-Draft Does It!

The downdraft principle is an exclusive, clinching argument for salesmen. Easily understood by home owners. Aladdin Oil burners are leading in sales in many territories. Our franchise is desirable because it means profits. Write today.

ALADDIN UTILITIES CORPORATION

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QUIET **Aladdin** *Uniform* Fuel-Oil Heat

WHY WE SAY CONTINUOUS EVEN HEAT!

5 Contact Points on the McIlvaine Graduated Thermostat [which reacts to a change in temperature of a fraction of a degree]

correspond with

5 Stopping Positions of the McIlvaine Automatic Controller—

Making always available

5 Different Sizes of Flame—automatically regulated by moving shutter which increases or decreases flame to correct size as called for by thermostat.

Listed as Standard by the Underwriters' Laboratories

The result of this patented McIlvaine 5 point control is a continuous, even flow of heat—automatically balanced and adjusted—with all the advantages of a continuous flame that never goes out, and the welcome elimination of any need for gas pilot or electric ignition.

No Other Oil Burner Has These Features

Write for details of the McIlvaine Sales Plan

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MEMBER OIL HEATING INSTITUTE OIL HEAT AS CONVENIENT AS SUNSHINE

McILVAINE OIL BURNER

Reduce heating wastes by figuring Insulite *into the job*

One of the most important details in connection with building maintenance is heating. As much or more attention is paid to the selection of suitable and economical heating apparatus than to any other detail.

It is important then, that everything which contributes directly to the efficient and economical operation of the heating plant should be carefully considered.

One of these important factors is insulation. Insulite structural insulation has been used successfully for more than sixteen years to save fuel by conserving a large percentage of the heat which is ordinarily wasted through the roofs and side walls of industrial plants, schools, apartments, churches, etc.

Insulite is economically and easily applied. It is a rigid form of insulation—made in two thicknesses, ½ and 1 inch.

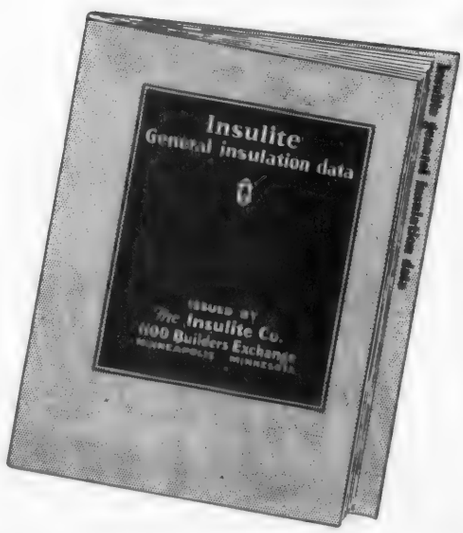
Engineers and architects will find our new bulletin helpful in figuring fuel savings and other problems. It has been prepared by insulation engineers—in such form that it will fit into your file and at the same time be readily accessible.

Insulite

The Insulite Co.

Minneapolis, Minn.

If you desire a copy of this bulletin just put your name on the coupon below. No obligation to you.



THE INSULITE CO.,
Minneapolis, Minn.

Please send me your file of insulation data.

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Address .....

City .....

Silent Automatic Sales Doubled!

There are two good reasons why Silent Automatic dealers are so decidedly successful.

One is, that *any* dealer would be successful if he sold a burner like Silent Automatic—a burner of such widely recognized merit, that during the past twelve months its national sales were more than double its previous year's record.

The other reason is eight-fold—the Silent Automatic franchise.

THIS FRANCHISE PROVIDES:

1. Direct factory connection.
2. Vigorous advertising cooperation through newspapers and direct mail.
3. Background of national newspaper and magazine advertising.
4. Thorough mechanical instruction with one-way fare paid to the largest domestic oil burner laboratory in the world.

$395 *One size—one price—* for cottage or mansion.

Complete with automatic safety and operating controls. Nominal installation costs depend on basement conditions, oil storage equipment and local regulations.
Listed as standard by the Underwriters' Laboratories
There is only one *Silent*

5. Competent factory mechanical supervision.
6. Volume sales, due to supreme performance, national reputation, and low price.
7. Minimum service overhead.
8. Permanent association, due to the company's experience, capable management and strong financial position.

If you think you can qualify for a Silent Automatic franchise, write, wire or phone the factory in Detroit.

SILENT AUTOMATIC CORPORATION, 255 MELDRUM AVE., DETROIT, MICH.

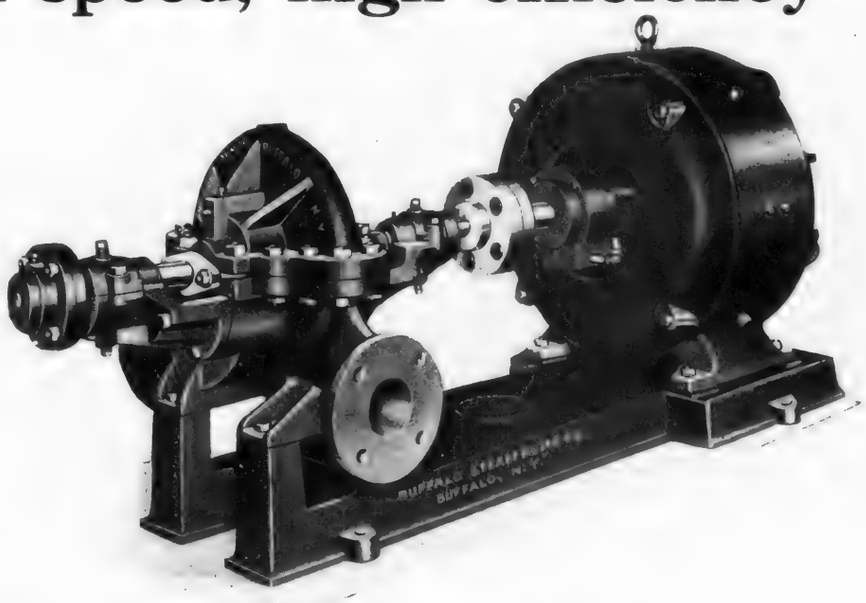
SILENT AUTOMATIC
THE NOISELESS OIL BURNER

NEW—high speed, high efficiency

Single Stage— Double Suction

The new single stage, double suction class SF pump meets boiler pressures up to 200 lbs. or heads up to 500 ft. It costs less than a multistage or steam pump—yet gives higher efficiency. Designed for motor or turbine speeds up to 3600 r.p.m.

Write for complete information on this new development in high efficiency pumping



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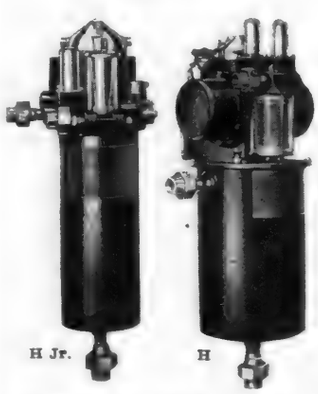
Buffalo Steam Pump Co.

In Canada—CANADIAN BLOWER & FORGE CO., Ltd., Kitchener, Ont.

efficient, reliable pumps

480 Broadway, Buffalo, N. Y.

Cook Safety Automatic Fuel Oil Pumps



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Anti - Syphon devices that eliminate inside storage.

Maintain a constant level of oil.

Stop motor in case of excessive flow.

Neat and compact design.

Sturdy construction.

Entirely automatic.

Easy to install.

Low List Price.

Visit our booth No. 710 at the Power Show, New York December 5-10.

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MANUFACTURERS OF

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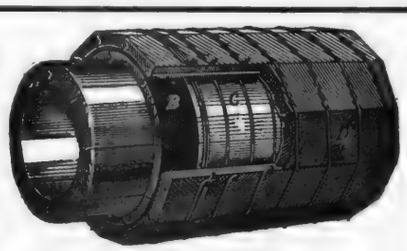
Packingless Expansion Joints and other special fittings for underground steam distribution mains.

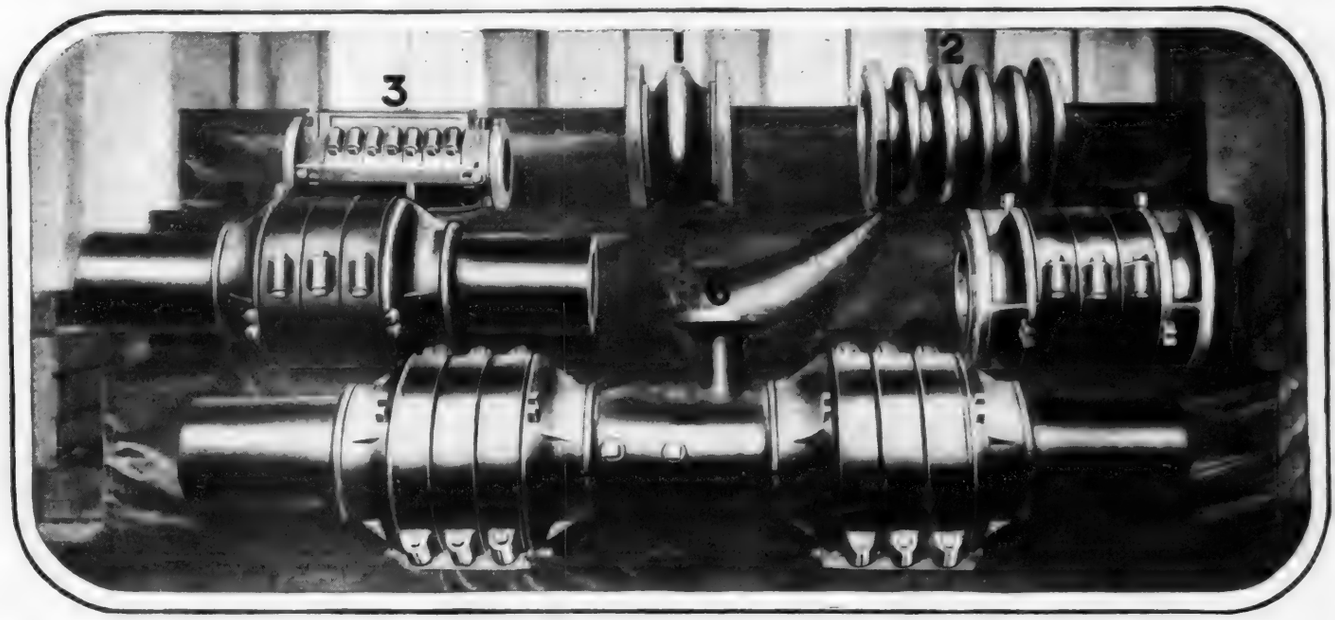
Wyckoff's Improved Cypress Covering



Lasts as Long as The Pipe Itself

As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

A. WYCKOFF & SON CO. ELMIRA, N. Y.



Packless Expansion Joints that can't leak

A few of the services, where

BADGER Expansion Joints

are used.

Central Station Steam Lines
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For any Special Service subject to temperature change—Consult our engineers.

BADGER Engineering Service

Badger engineers are designers, manufacturers and installation experts for the following and kindred power plant products: Pipe Bends, Chemical Apparatus, Copper and Sheet Metal Work, Copper Boilers.

BADGER EXPANSION JOINTS WITH the ONE Piece deeply corrugated copper expansion element between two flanges or homogeneously attached to steel or wrought iron nipples for welding directly into the pipe line have no sliding joints or stuffing boxes to pack and consequently *cannot* leak. Made for all services. Equipped with monel metal sleeves for superheated steam and high temperatures.

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4 SELF-EQUALIZING EXPANSION JOINT—flanged; sizes 6 in. and larger; pressures to 200 lb.; 1, 2, 3, 4 or 5 corrugations; expansion ½ in. per corrugation.

5 SELF-EQUALIZING EXPANSION JOINT—with pipe ends for welding into line; sizes 5 in. and larger; 1, 2, 3, 4 or 5 corrugations; expansion ½ in. per corrugation.

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Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

DISTILLERS, (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Midwest Air Filters, Inc., Bradford, Pa.
Pecco, Inc., St. Louis, Mo.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

ENGINES, STEAM, AUTOMATIC
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ENGINES, STEAM, HIGH SPEED
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., The, Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Foster Wheeler Corporation, Carteret, N. J.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, DISC PRESSURE
DeBothezat Impeller Co., Inc., New York.

FANS, SUPPLY AND EXHAUST
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, FLANGED
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.

FLANGES
Clow & Sons, James B., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.

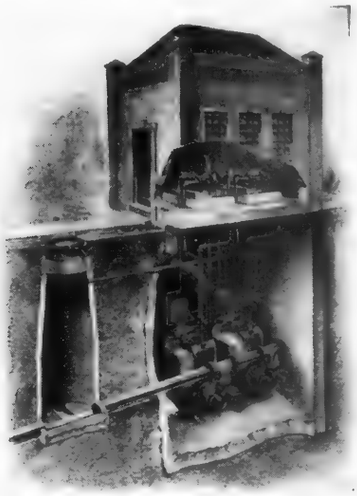
GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.
Franklin Gas Burner Appliance Co., Cincinnati, Ohio.

GASKETS, ASBESTOS
Jenkins Bros., New York.
Johns-Manville Corp., New York.

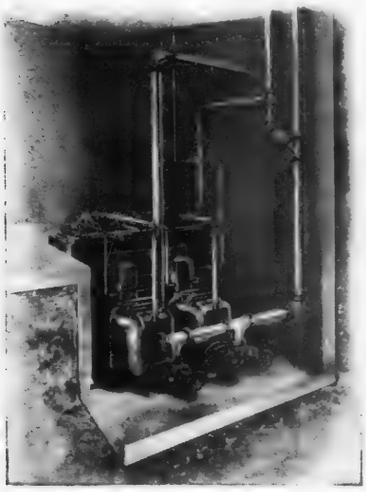
GASKETS, METALLIC
Jenkins Bros., New York.

GASKETS, RUBBER
Jenkins Bros., New York.

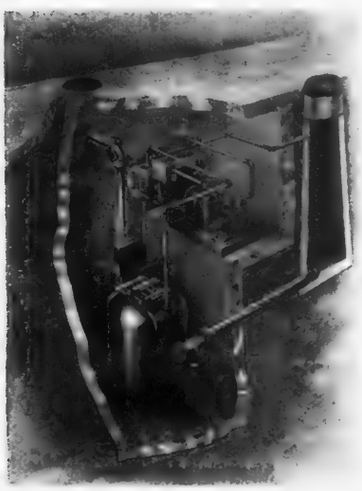
No intricate air valves in these sewage plants



A duplex installation. Widely used in municipal work for pumping sewage from low areas into gravity sewer.



Installation for office building, apartment house, hotel or hospital. Discharge is into street sewer.



Underground installation for municipal work.

Throughout the Jennings Sewage Ejector you will notice a simplicity and sturdiness in construction that make possible two outstanding advantages in pneumatic equipment of this kind—trustworthy performance, at the least cost.

Intricate air valves and similar complicated mechanisms have been avoided. There are no inaccessible parts. Nor any devices likely to get out of order and require attention.

Let us send you further details before you lay out your next sewage ejector plant.

NASH ENGINEERING COMPANY

81 WILSON ROAD **SO. NORWALK, CONN.**

Branch Sales Offices: Atlanta, Birmingham, Boston, Buffalo, Chattanooga, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Kansas City, Los Angeles, Louisville, Memphis, Miami, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington, D. C. **In Canada:** Montreal, Toronto, and Vancouver. **European Offices:** London, Eng., Norman Eng., Co.; Brussels, Belgium and Amsterdam, Holland, Louis Reijners & Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Pumps

GAUGE BOARDS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow & Sons, James B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Co., New York.

GAUGES, DRAFT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS, (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Kewanee Boiler Co., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa

GRATES, ROCKING
Kewanee Boiler Co., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

GRATES, SHAKING
Kewanee Boiler Co., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING, CIRCULAR
Pyramid Iron Products Corp., New York.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, STATIONARY
Frost Mfg. Co., Galesburg, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRILLES
Metalace Corporation, Boston, Mass.

HEAT CABINETS
Circulair Heat, Inc., Louisville, Ky.
Clow & Sons, James B., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Trane Co., The, LaCrosse, Wis.

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Rome-Turney Radiator Co., Rome, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Molby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Thatcher Co., The, Newark, N. J.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER, (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

HEATING SYSTEMS, GAS
Clow & Sons, James B., Chicago, Ill.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa.
Thatcher Co., The, Newark, N. J.
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Spray Engineering Co., Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.
Johns-Manville Corp., New York.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Mason Regulator Co., Boston, Mass.
New York Blower Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.
Spray Engineering Co., Boston, Mass.

Chicago" Pumps

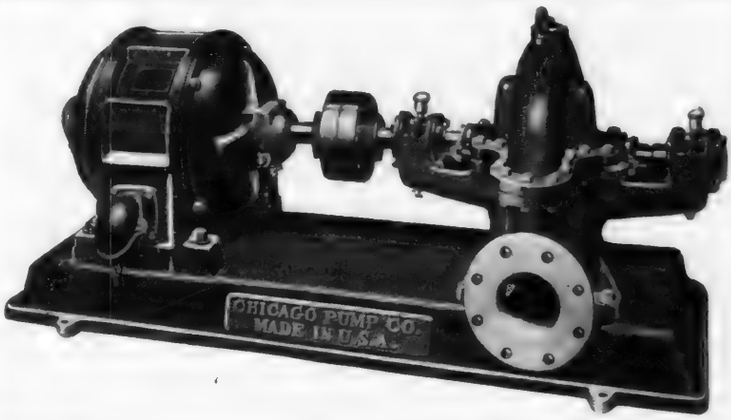
House-Fire-Circulating-Booster

S. W. STRAUS BUILDING
Chicago, Ill.

Graham, Anderson, Probst & White, Architects

American Carbonic Machinery Co., Refrigeration Contractors

6 "Chicago" type D Pumps
3 Other "Chicago" Pumps



"Chicago" type D Centrifugal Pump—Single Stage —Double Suction—Horizontally Split Case— Ball Bearings.

ELVERSON BUILDING
Philadelphia, Pa.

Rankin, Kellog & Crane, Architects

W. M. Anderson, Plumbing & Heating Contractor

6 "Chicago" type D Pumps
3 Other "Chicago" Pumps

Ball Bearing · Horizontally Split Case · Pumps

"CHICAGO" type D Pumps are built with the precision of a fine tool. That is why they operate so smoothly, so quietly. That is why they run on year after year with no appreciable wear. A close inspection of "Chicago" type D Pumps will disclose many interesting features of good design and inherent quality.*

BALL BEARINGS: "Chicago" type D Pumps represent the ultimate in ball bearing machinery. Perfect alignment is assured with ground shafts, and ground bearing housings. Clean lubrication is guaranteed by wick filters, and sealed housings. No bad oil, water, or grit can reach the bearings.

CAST-ON BEARING BRACKETS: "Chicago" type D Pumps are short and sturdy. The cast-on bearing brackets shorten the distance between bearings. This relieves torsional strain on shafts and avoids whipping. Cast-on Brackets cannot shift in shipment or installation.

CORED WATER-SEAL: The water passages for sealing packing on "Chicago" type D Pumps are cored in casing when pumps are cast. There are no water-seal pipes to break. Renewal of packing is minimized because holes are cored at low-pressure point in casing.

[*Engineering Note: It is a reasonable conclusion that a pump built like the "Chicago" type D will have splendid efficiency. See Bulletin 101-A.]

CHICAGO PUMP COMPANY

SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM

2325 WOLFRAM ST. . . . CHICAGO. ILL.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Lincoln Electric Co., Cleveland, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Young Pump Co., Chicago, Ill.

OIL BURNERS
Aladdin Utilities Corp., Chicago, Ill.
American Nokol Co., Chicago, Ill.
Automatic Burner Corp., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
Laco Gas Burner Co., Griswold, Iowa.
McIlvaine Burner Corporation, Chicago, Ill.
Nu-Way Corporation, Rock Island, Ill.
Petroleum Heat & Power Co., New York.
Silent Automatic Corp., Detroit, Mich.
Sundstrand Engineering Co., Rockford, Ill.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill.

OIL BURNER EQUIPMENT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Cook Electric Co., Chicago, Ill.
Grant Accessories Corp., New York.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Monroe Machine Tool Co., Chicago, Ill.
Preferred Utilities Mfg. Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster Electric Co., Racine, Wis.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Basel Mfg. Co., The, Kansas City, Mo.
Federal Gauge Co., The, Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Webster Electric Co., Racine, Wis.

PANELS, ACCESS
Higgin Mfg. Co., Newport, Ky.

PIPE, CAST IRON
Clow & Sons, James B., Chicago, Ill.

PIPE, STEEL
Clow & Sons, James B., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PIPE, WOOD
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE HANGERS
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.

PIPE THREADING & CUTTING MACHINES
National Pipe Bending Co., New Haven, Conn.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED
Horton Mfg. Co., Minneapolis, Minn.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
General Air Filters Corp., New York.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.
Yeomans Brothers Co., Chicago, Ill.
Young Pump Co., Chicago, Ill.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Yeomans Brothers Co., Chicago, Ill.
Young Pump Co., Chicago, Ill.

PUMPS, OIL
Monroe Machine Tool Co., Chicago, Ill.

PUMPS, ROTARY
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.
Yeomans Brothers Co., Chicago, Ill.

PUMPS, TURBINE
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.
Yeomans Brothers Co., Chicago, Ill.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Pump Co., Chicago, Ill.

RADIATOR ENCLOSURES OR SHIELDS
Acme Radiator Shield Co., Cincinnati, Ohio.
American Metal Products Corp., St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Gleockle, Jr., A. F., Rochester, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Co., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.

RADIATORS, BRASS
Circulair Heat, Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.

RADIATORS, GAS HEATED
Clow & Sons, James B., Chicago, Ill.

RADIATORS, STEAM & WATER
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Molby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Co., New York.
Thatcher Co., The, Newark, N. J.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.
Young Pump Co., Chicago, Ill.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

REGULATORS, TEMPERATURE
(See Temperature Control).

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Swartwout Co., The, Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Seymour, James M., Newark, N. J.
Spray Engineering Co., Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray).

STRAINERS, OIL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Monroe Machine Tool Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

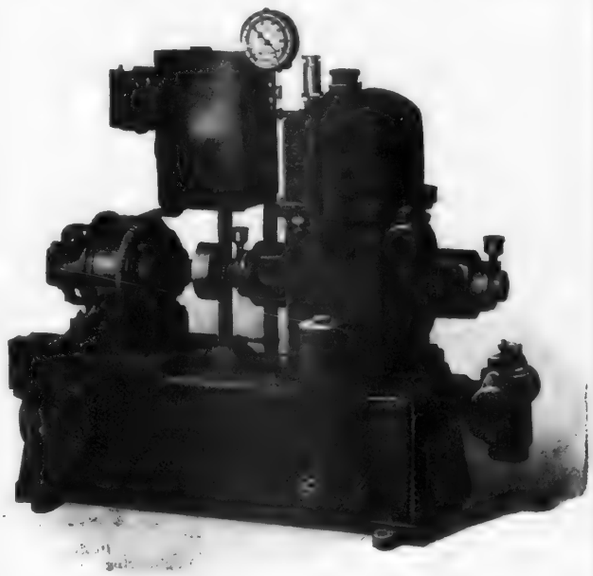
STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

TEMPERATURE CONTROL
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Basel Mfg. Co., The, Kansas City, Mo.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.

THERMOMETERS, RECORDING & INDICATING
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Co., New York.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

SKIDMORE



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high or low water line in the system when operating on float control?

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The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

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Graham, Anderson, Probst & White *Architects.*

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Since 1911 the reputation of Economy Pumps for quality material, precision in manufacture, and reliability has been enhanced. The makers seek constantly for more simplicity in design, durability of construction and new records of long service. That these claims are true is shown by the 16 years' experience with Economy in the Insurance Exchange — only another instance added to the already long list on Economy's books showing extraordinary satisfaction and service. Economy engineering cooperation, available to all Economy users, has much to do with the outstanding successes that recommend these pumps to you.

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Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Thrush & Co., H. A., Peru, Ind.

TRAPS, BUCKET

Swartwout Co., The, Cleveland, Ohio.

TRAPS, FLOAT

Sarco Co., Inc., New York.
Swartwout Co., The, Cleveland, Ohio

TRAPS, LIFTING

Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., The, Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Buffalo Forge Co., Buffalo, N. Y.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNDERGROUND PIPE CONDUITS

American District Steam Co., North Tonawanda, N. Y.
Johns-Manville Corp., New York.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Russell & Co., W. A., New York.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Sarco Co., Inc., New York.
Scott Valve Mfg. Co., Detroit, Mich.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, BALANCED

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, BLOW-OFF

Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.

VALVES, CHECK

Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, FLOAT

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, GLOBE, ANGLE & CROSS

Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Phila., Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, HYDRAULIC-OPERATING

Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., The, Cincinnati, Ohio.

VALVES, MAGNETIC

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

VALVES, NON-RETURN

Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Capitol Brass Works, Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton & Lidgerwood Co., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. So., New York.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, REDUCING

(See Regulators, Pressure).

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.
Thrush & Co., H. A., Peru, Ind.

VALVES, SAFETY

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

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American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
General Air Filters Corp., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Lakeside Company, The, Hermansville, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS

DeBothezat Impeller Co., Inc., New York
Midwest Air Filters, Inc., Bradford, Pa.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, MUSHROOM

Aeolus Dickinson Co., Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corp., St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson Co., Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

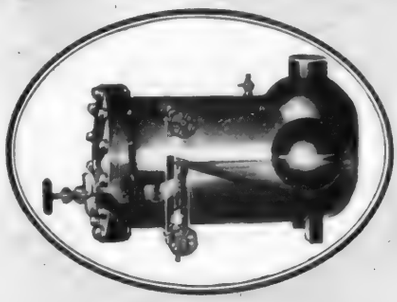
Clow & Sons, James B., Chicago, Ill

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.
Higgin Mfg. Co., Newport, Ky.

WELDERS, ELECTRIC ARC

Lincoln Electric Co., Cleveland, Ohio



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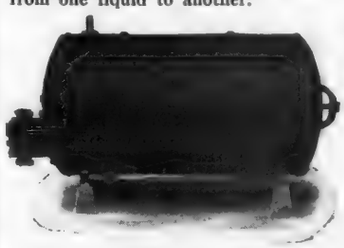

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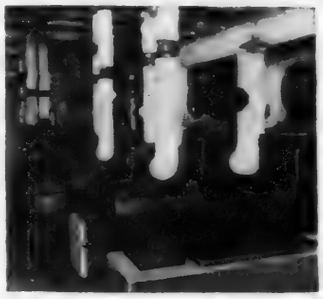

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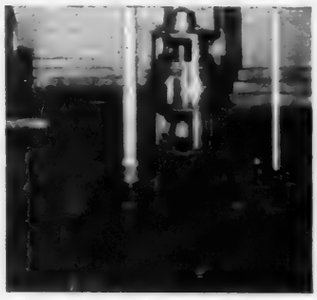

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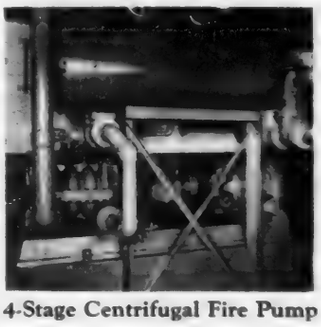

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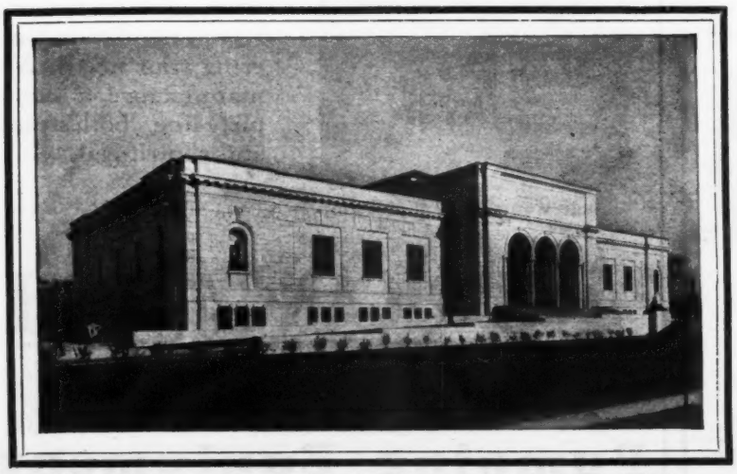

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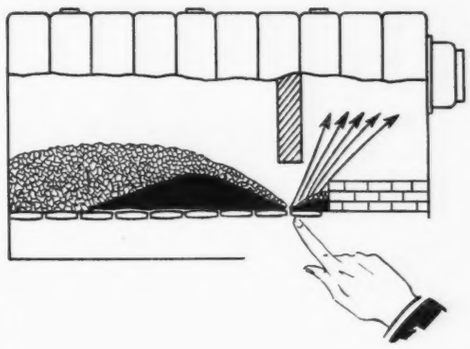

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3 How to Vacuumize a One Pipe Steam Heating System

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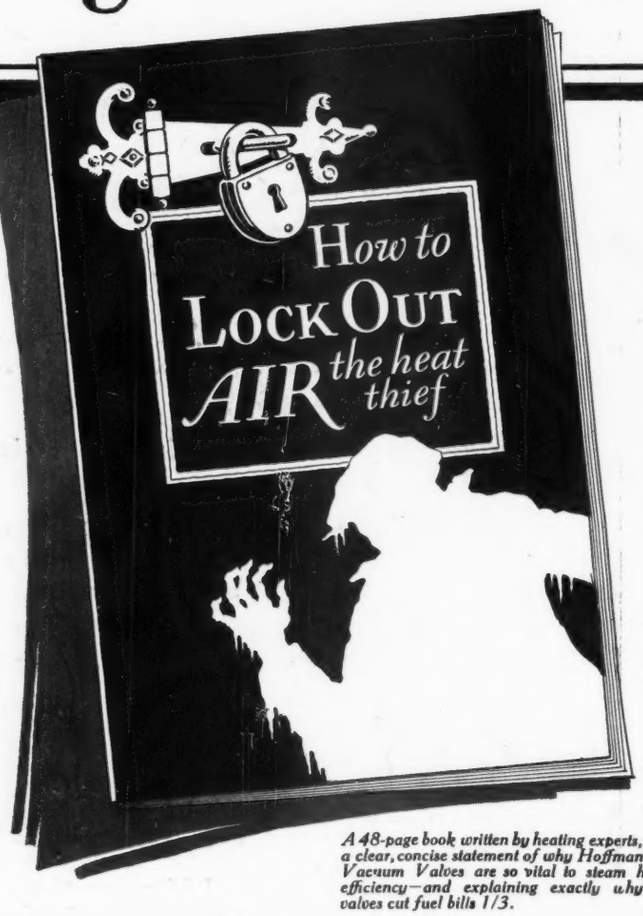

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